

MARCH, 1926

Annual Labor Saving Number

# Railway Engineering and Maintenance



**THE ANCHOR WITH THE BULL DOG GRIP**

CHICAGO

**THE P. & M. CO.**

NEW YORK

MONTREAL

LONDON

PARIS

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SYDNEY

# HY-CROME

**H**Y-CROME is both a labor and a money saver.

The ever widening acceptance of Hy-Crome superiority is based upon the repeated endorsement of men responsible for more efficient track maintenance.

Supreme resistance against fatigue is a Hy-Crome characteristic that guarantees permanent rail joint security.

Actual service under every operating condition has proven the false economy of attempts to duplicate this inbuilt Hy-Crome quality in any other nut lock.



**THE RELIANCE MFG. CO.  
MASILLON, OHIO**

NEW YORK, CLEVELAND, DETROIT, CHICAGO,  
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N. S. Kenney, Munsey Bldg., Baltimore, Md.  
Engineering Materials, Ltd., McGill Bldg., Montreal, Quebec, Canada

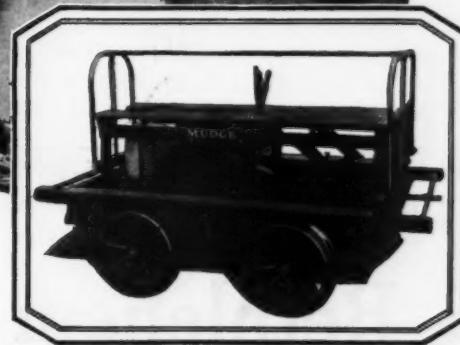
RAILWAY ENGINEERING AND MAINTENANCE

Published monthly by Simmons-Boardman Publishing Co., at 608 S. Dearborn St., Chicago. Subscription price: United States, Canada and Mexico, \$2.00; foreign countries, \$3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

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Classified Index to Advertisers, Pages 80-82

LOW E R      C O S T      P E R      C A R      P E R      M I L E



## *On the trail of Daniel Boone*

DOWN in the Appalachians, through wooded hills and valleys made famous by America's pioneers—where Daniel Boone broke through to open a new and great west. There's where sturdy pioneers slowly migrated to build a greater country. How the picture has changed!

Today Mudge Motor cars—husky thoroughbreds—wind their ways through the historic hills. Power! Plenty of it—for grades and curves. These cars are as faithful as the settler's trusty steed. For Mudge Motor cars are built for steady, hard service wherever there's a railroad track.

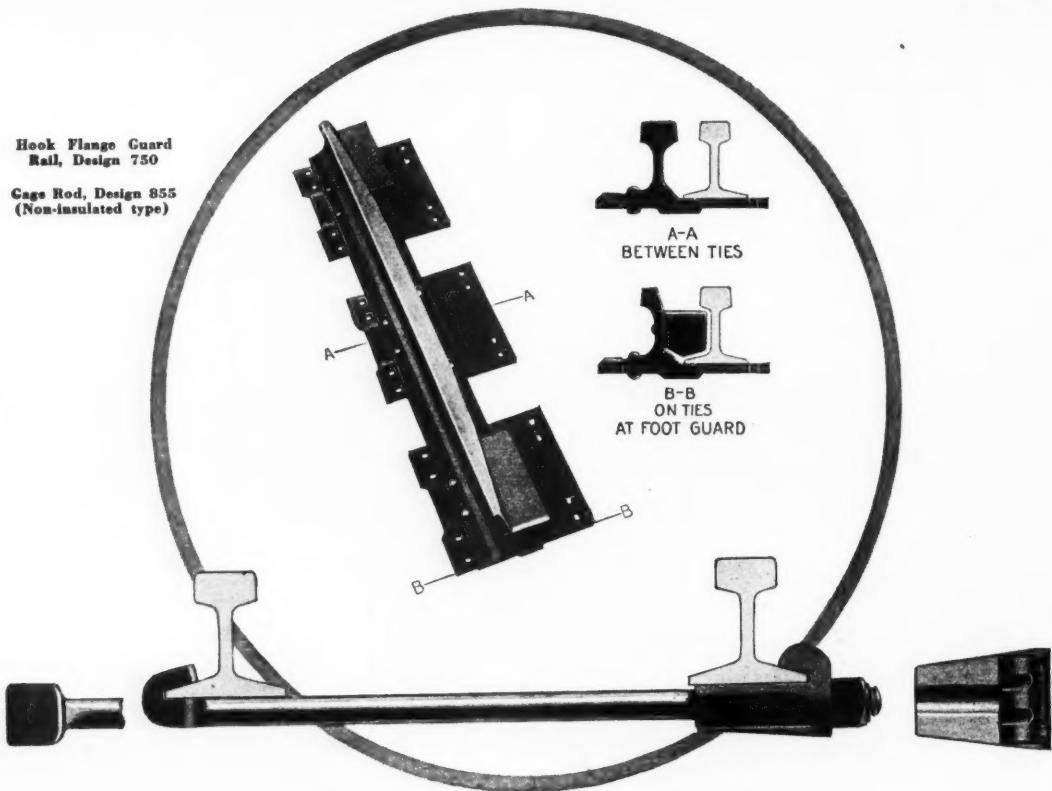


## Mudge & Company

Manufacturers—Railroad Equipment  
Railway Exchange Building, Chicago

A MOTOR CAR FOR EVERY SERVICE

REAM 3-B-R75



## Bethlehem Railroad Products

are of the latest improved designs; constructed of carefully selected materials; and will efficiently serve the present and future needs of Railroads. Included among the products manufactured are:

**Booths**  
**70½-71-71½-72**

National Railway Appliances Asso. Exhibit

Chicago, Ill.—March  
8-11

Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

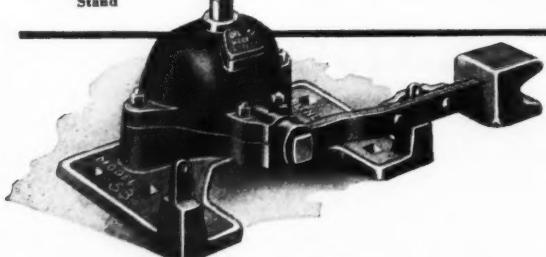
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**BETHLEHEM STEEL COMPANY**  
*General Offices*  
Bethlehem, Pa.

*District Offices*

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh Buffalo Cleveland Detroit Cincinnati Chicago St. Louis San Francisco Seattle Los Angeles Bethlehem Steel Export Corporation, 25 Broadway, New York City,  
Sole Exporter of our Commercial Products

Model 53A Switch Stand



**BETHLEHEM**  
**SPECIAL LAYOUTS**  
**AND TRACKWORK**

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March, 1926

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# Railway Engineering and Maintenance

*Formerly the Railway Maintenance Engineer*

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Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

EDWARD A. SIMMONS, *President*  
 L. B. SHERMAN, *Vice-Pres.*

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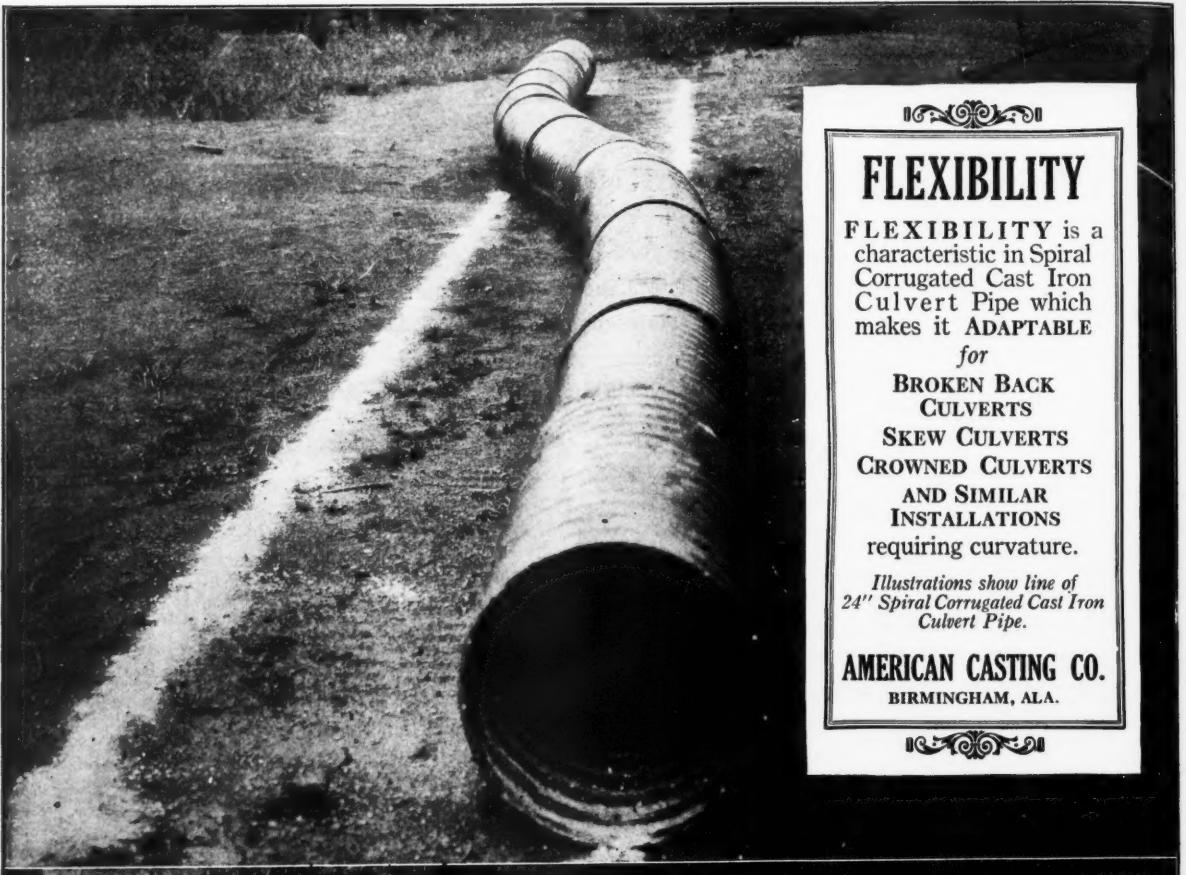
Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us

change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico, \$2.00 per year; foreign countries \$3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £·s·d.

*Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)*



## FLEXIBILITY

FLEXIBILITY is a characteristic in Spiral Corrugated Cast Iron Culvert Pipe which makes it ADAPTABLE for  
BROKEN BACK CULVERTS  
SKEW CULVERTS  
CROWNED CULVERTS  
AND SIMILAR INSTALLATIONS requiring curvature.

*Illustrations show line of 24" Spiral Corrugated Cast Iron Culvert Pipe.*

**AMERICAN CASTING CO.**  
BIRMINGHAM, ALA.





## PROGRESS

Again comes the National Railway Appliance Show to emphasize the constant progress and achievement of the railroad supply industry.

Years of development and unremitting effort, skill, ingenuity and wide resources—reach new heights in the development and perfection of countless devices to make railroading safer and more economical.

At booths 120 to 139 you will be reminded that The Q & C Company is continuously striving to improve the several devices which have made an enviable record in past years on the railroads throughout the country. Drop in and see the maintenance exhibit of the convention.

Booths - - - - - - - - - 120-139

**The Q&C Company, 90 West St., New York**

Peoples Gas Building, Chicago

Railway Exchange Building, St. Louis

# SAVE The LABOR of Unloading

Cinder Service  
On the B.R. & P.

## WELCOME at Booth No. 115

COME and see our photographs showing how air-operated Extension Side Dump Cars are saving time and labor in all classes of railroad service. They tell a convincing story and show why more than 90 companies have purchased this equipment.

CLARK CAR COMPANY  
PITTSBURGH, PA.

New York                    Chicago  
52 Vanderbilt Ave. 122 S. Michigan Ave.

Rialto Building  
San Francisco

Rip Rapping  
on the N.Y. Central

Ditcher Service  
On the B.R. & P.

Filling Bridge Approaches  
on the Santa Fe

# Extension Side Dump Cars Air Operated

## Engine bolts three times as good

Engine bolts made of the right alloy steel will do a better job in a locomotive than engine bolts made of iron ever could. In the first place, engine bolts made of alloy steel are two to three times as strong as engine bolts made of iron—and they will save you money in repairs and maintenance. Ask us to prove both of these statements.

INTERSTATE IRON & STEEL CO.  
104 South Michigan Avenue, Chicago

*Open Hearth Alloy Steel Ingots, Billets, Bars  
Wire Rods, Wire, Nails, Rivets and Cut Tacks  
Iron Bars and Railroad Tie Plates*

# Interstate Steels

*District Offices:*

NEW YORK—52 Vanderbilt Avenue  
DETROIT—Washington Boulevard Building  
MILWAUKEE—First Wisconsin National Bank Building  
CLEVELAND—Union Trust Building

ST. PAUL—Merchants National Bank Building  
ST. LOUIS—International Life Building  
SAN FRANCISCO—Monadnock Building  
KANSAS CITY—Reliance Building



See Our Exhibit  
Space No. 117

IMPROVED  
**HIPOWER**

it  
7

R

# Save It With Safety

**IMPROVED HIPOWER** commends itself to the far-sighted engineer who must explain performance and labor costs. It is a genuine labor saving device and also a safety device of the highest degree.

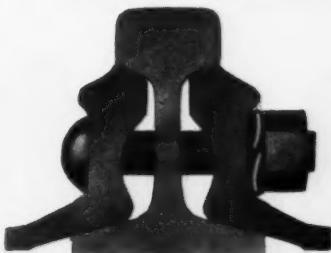
**IMPROVED HIPOWER** with its unique design of normal spiral with superimposed curves, has advantages which are plainly apparent. It is always active because it cannot be flattened by ordinary wrenching. It stands in readiness to cushion and absorb shocks as they occur. It does not transmit them directly to the bolts as in the case of a fully flattened device.

The ever acting re-active pressure forces the joint bars into their proper places which assures tight joints at all times. This continuous security prevents bolt breakage, reduces battering of rail ends and the malformation of angle bars—and minimizes the cost of retightening track joints.

**IMPROVED HIPOWER** is always on the job reducing maintenance costs and increasing the reliability of operation.

*Come and see us at Booth No. 117*

**The National Lock Washer Co.**  
Newark, N. J., U. S. A.



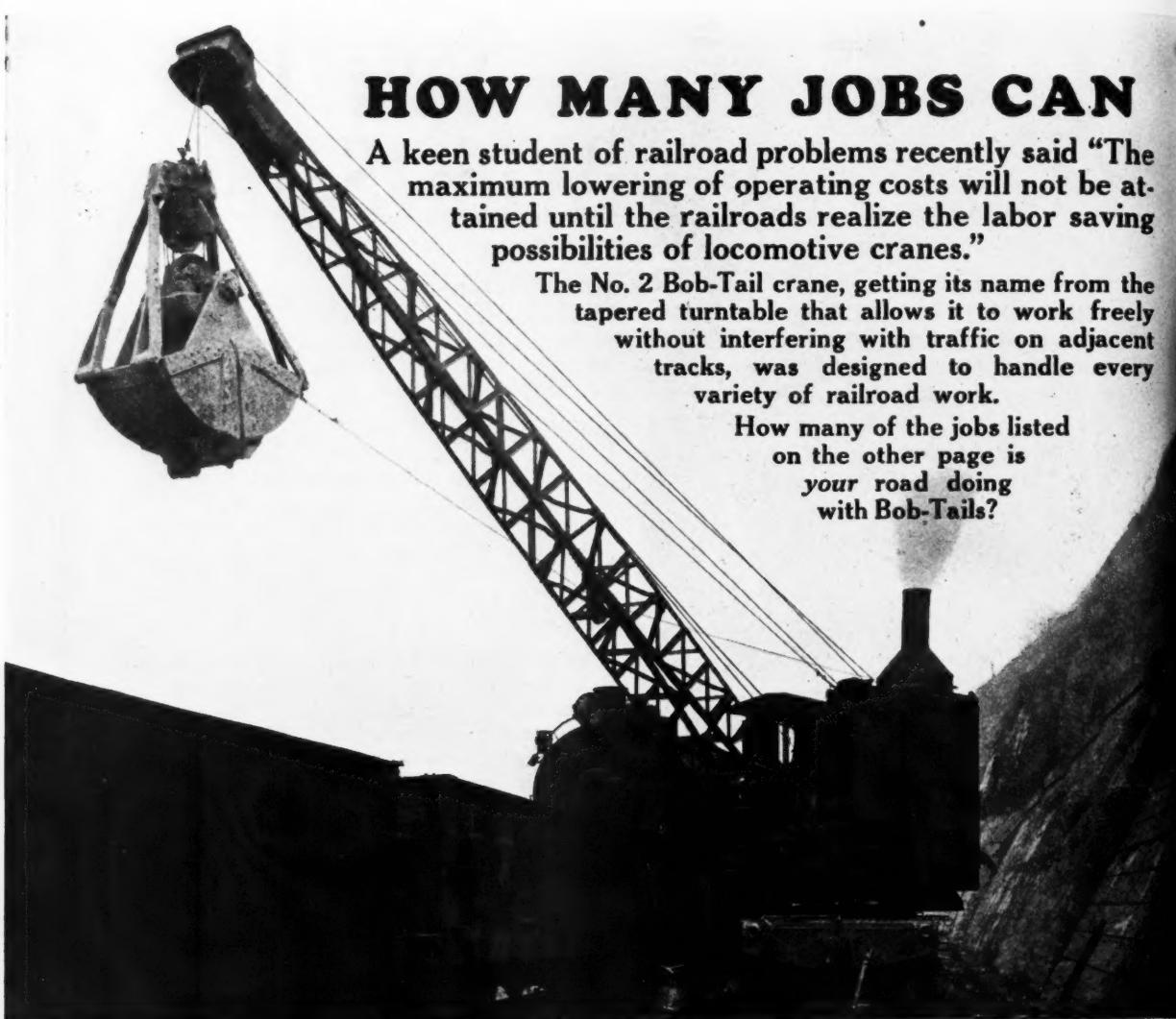
## Maintains the Bolted Security of Railway Track Joints

## HOW MANY JOBS CAN

A keen student of railroad problems recently said "The maximum lowering of operating costs will not be attained until the railroads realize the labor saving possibilities of locomotive cranes."

The No. 2 Bob-Tail crane, getting its name from the tapered turntable that allows it to work freely without interfering with traffic on adjacent tracks, was designed to handle every variety of railroad work.

How many of the jobs listed  
on the other page is  
*your road doing*  
with Bob-Tails?



Home Office  
CLEVELAND

BOSTON  
BUFFALO

CHICAGO  
DETROIT

KANSAS CITY  
KNOXVILLE

LOS ANGELES  
MONTREAL

NEW ORLEANS  
NEW YORK

*produced by* **McMyler**

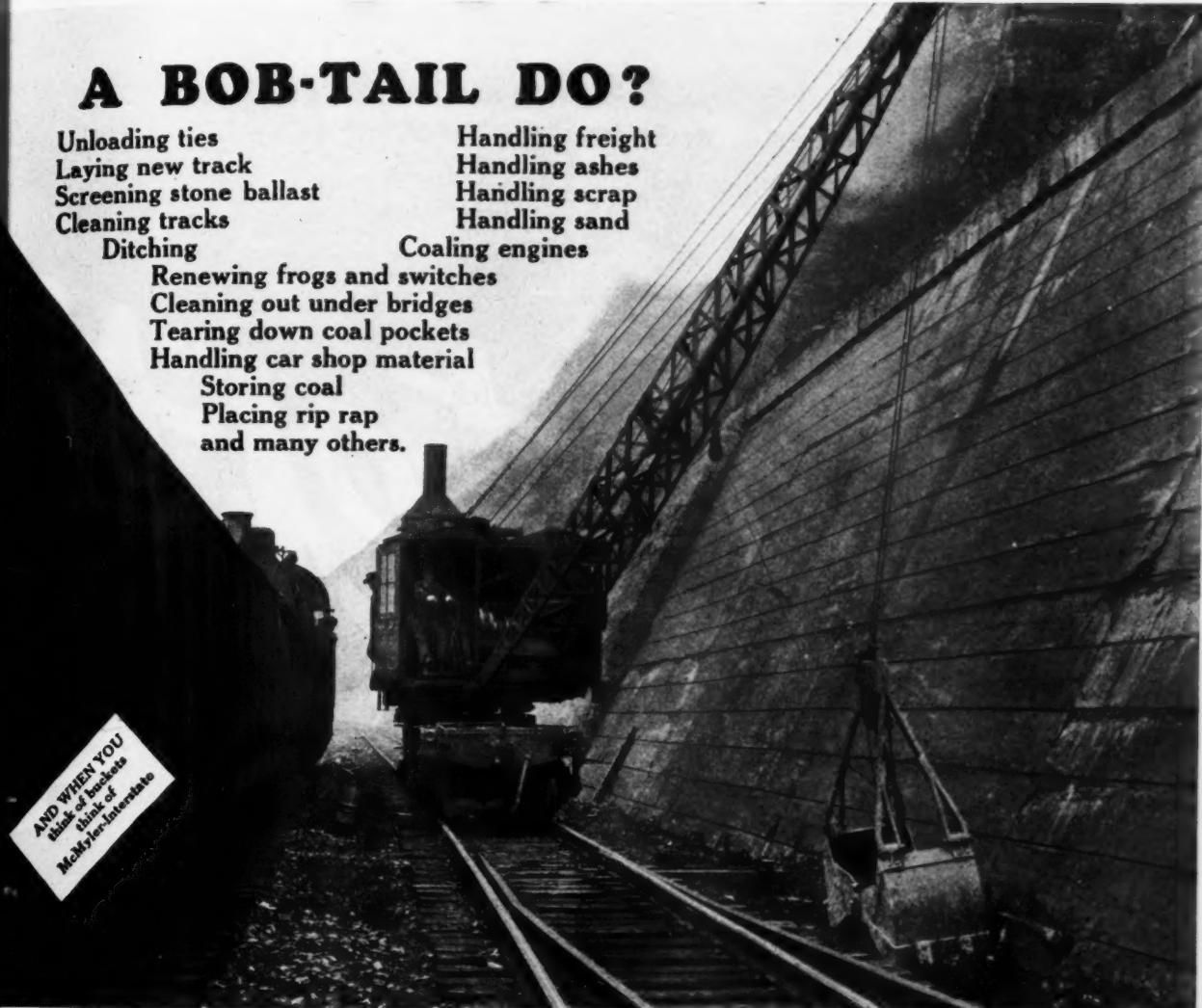
**Locomotive Cranes—Crawler Cranes—Gas Cranes**

# A BOB-TAIL DO?

- Unloading ties
- Laying new track
- Screening stone ballast
- Cleaning tracks

**Handling freight  
Handling ashes  
Handling scrap  
Handling sand**

- Ditching
- Coaling engines
- Renewing frogs and switches
- Cleaning out under bridges
- Tearing down coal pockets
- Handling car shop material
- Storing coal
- Placing rip rap
- and many others.



**AND WHEN YOU**  
think of buckets  
think of  
**McMyler-Interstate**

**PHILADELPHIA  
PITTSBURGH**

**RICHMOND  
ST. LOUIS**

**SAN FRANCISCO  
SAN ANTONIO**

**ST. PAUL  
TORONTO**

**WINNIPEG**  
**MEXICO CITY**

**Home Office  
CLEVELAND**

G-3-127

# Interstate





# national

## Advantages of International Service

*International* produces millions of ties—every one to A. R. E. A. Specifications. Here's what you get:

*Sound Timber*—All ties are hewed from sound timber and removed promptly from woods to prevent decay.

*Accurate Grading*—Each tie is graded in strict accordance with the dimensions prescribed in the A. R. E. A. specifications.

*Proper Seasoning*—Moisture tests are made regularly to prevent over seasoning—yards are tiled drained free from vegetation.

*Effective Treatment*—Preservatives and treatments are under the exacting control of the Department of Chemistry and Tests. A. R. E. A. Grade 1 creosote oil is used and the full quantity of oil you specify stays in the ties.

*Permanent Interest*—Every tie is trade marked permanently with the I. C. dating nail as proof of quality and correct grading.

*Prompt Service*—Efficient and up-to-date equipment enables *International* to deliver quality ties in quantity.

*These ties are ready for you now*

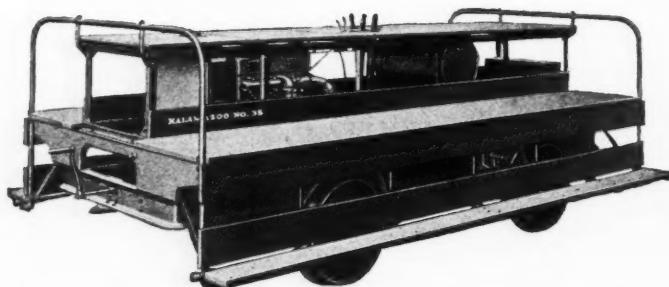
**International Creosoting & Construction Co.**

General Office—Galveston, Texas



# SPECIFICATION TIES

# SAFETY—COMFORT—POWER



Kalamazoo No. 35 Motor Car Standard Body seating thirty persons.



Kalamazoo No. 16-L Motor Car seating one to three persons.



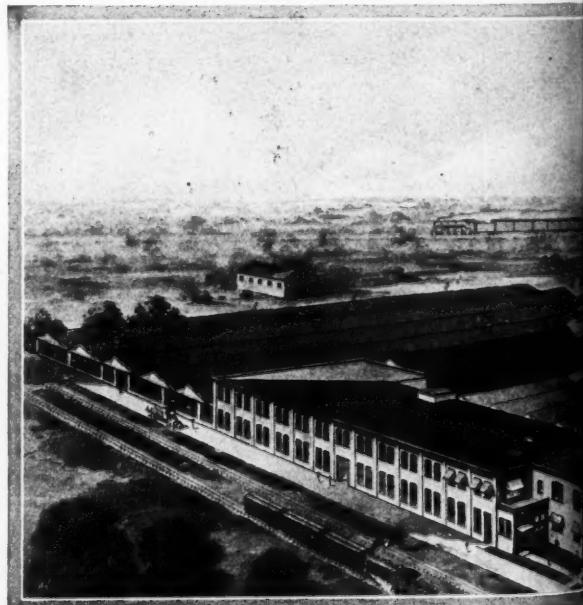
Kalamazoo No. 25-A Hump Car seating twenty-four persons.

**KALAMAZOO  
RAILWAY SUPPLY  
COMPANY**  
MANUFACTURERS

Kalamazoo, Mich.  
Chicago, March 8th to 11th

See our exhibit at the Coliseum,  
Chicago, March 8th to 11th inclusive,  
Spaces 23, 24, 25, 8 and  
8½.

- Wood Center
- Wheels —
- Track Drills —
- Gauges —
- Levels —
- Electric
- Crossing
- Gates —



**"KALAMAZOO" MEANS**

# POWER in these MOTOR CARS



Kalamazoo No. 16 Motor Car seating one to four persons.



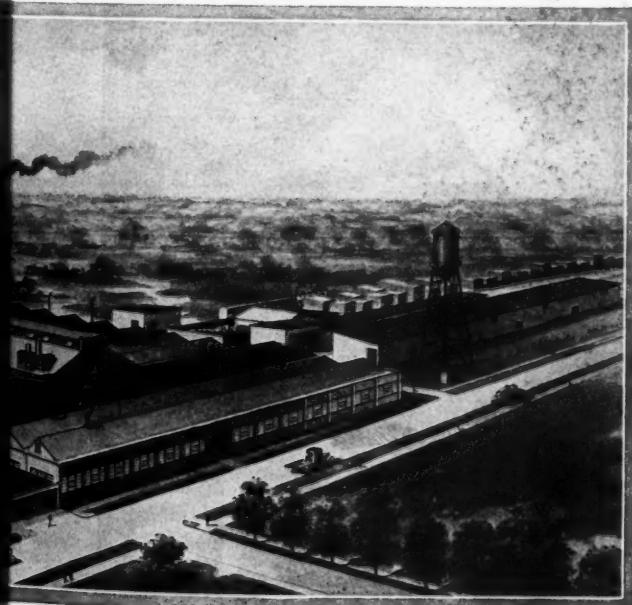
Kalamazoo No. 35-S Passenger Car seating twenty-three persons.



Kalamazoo No. 17 Section Car seating six to eight persons.



Kalamazoo No. 23 Motor Car seating eight to ten persons.



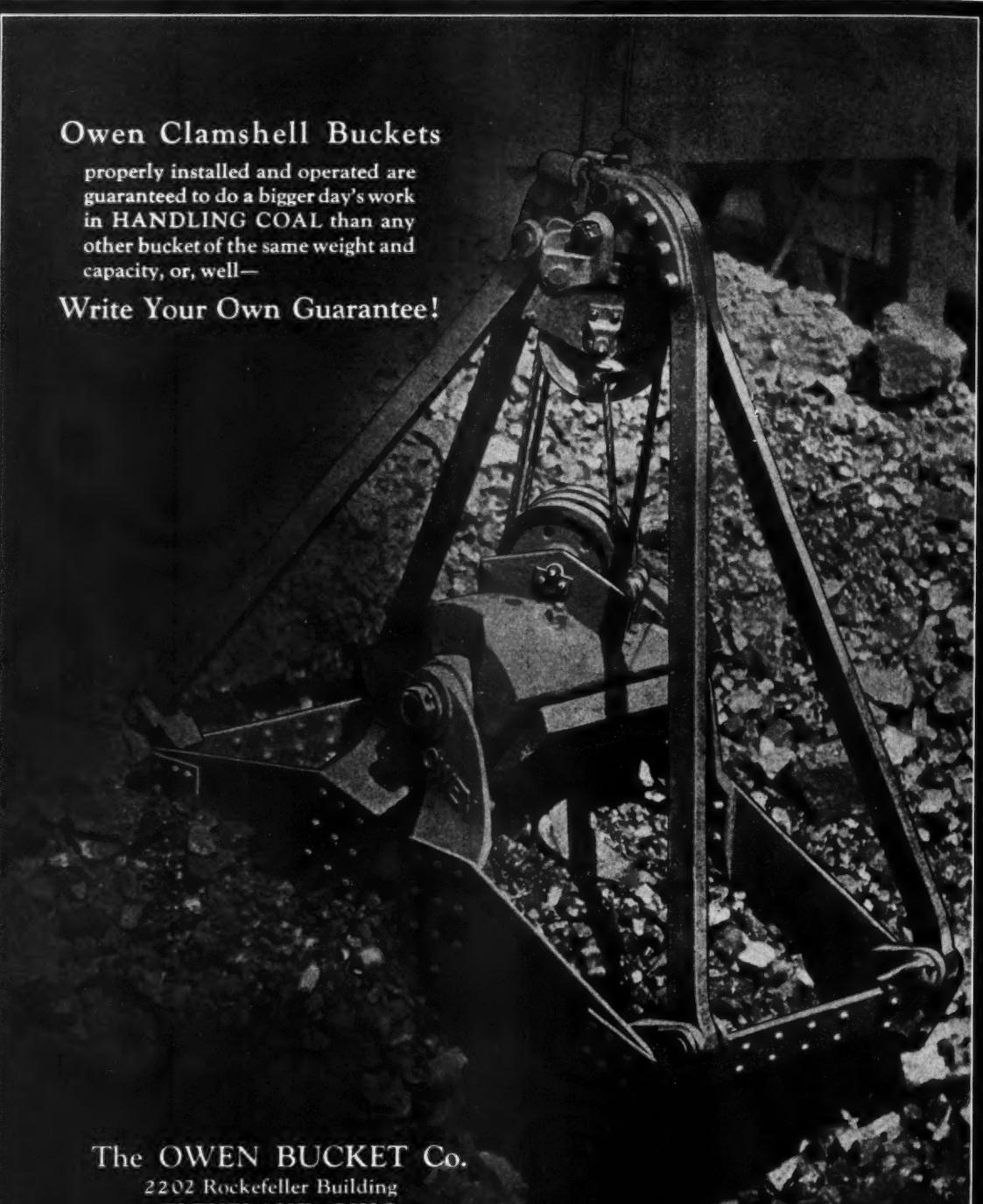
ENS SERVICE TO YOU

- Motor Cars —**
- Trailers —**
- Hand Cars —**
- Push Cars —**
- Rail Cars —**
- Velocipede Cars —**
- Rolled Steel**
- Wheels —**

## Owen Clamshell Buckets

properly installed and operated are guaranteed to do a bigger day's work in HANDLING COAL than any other bucket of the same weight and capacity, or, well—

Write Your Own Guarantee!



The OWEN BUCKET Co.

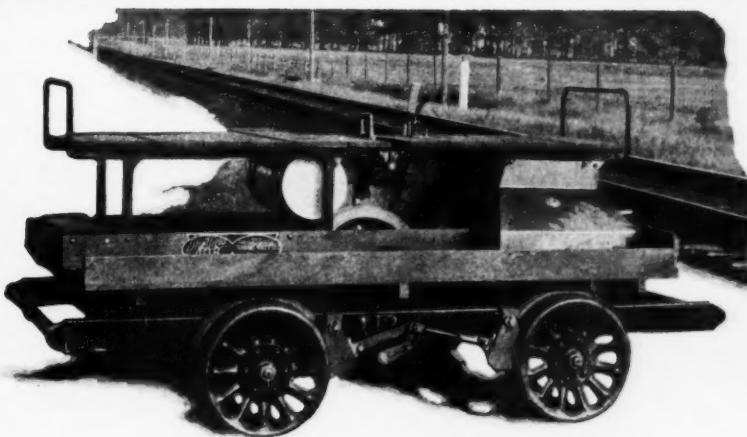
2202 Rockefeller Building  
CLEVELAND, OHIO

Baltimore      Chicago      Dallas      Los Angeles      Minneapolis      Philadelphia  
Pittsburgh      New York      Miami      Portland      St. Louis      San Francisco



# Owen Buckets

INSURE A BIGGER DAY'S WORK



**The Sheffield 40-B**  
Automobile type pressed  
steel frame.  
Air-cooled 2-cylinder  
4-cycle engine de-  
signed for exceptional  
torque at low speeds.  
Three-point suspension  
of engine.  
Timken roller bearings  
in engine and axle  
bearings.  
Greatly simplified fric-  
tion transmission.

## *Incorporating the best automotive practice in section motor cars of long-established dependability*

In the Sheffield 40-B—the fine car of section motor cars—and in the Sheffield 45—the newest Fairbanks-Morse car—the best features of automotive engineering have been incorporated. Sheffield Motor Cars, the pioneers, still definitely lead the field.

The Sheffield 40-B gives you super performance. Plenty of power for trailing loads on grades, for pulling

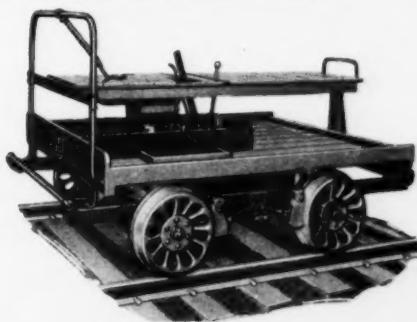
against head winds—for the extraordinary as well as the usual demands.

The Sheffield 45, patterned after the "40-B" but less highly powered, gives remarkable economy in all ordinary section and extra gang service. It has the largest deck space ever provided on a section motor car—22 square feet of unobstructed surface.

Note special features listed.

### *The Sheffield 45*

Patented Ricardo cylinder head gives more power.  
Three-point suspension of engine.  
Crankshaft mounted on Timken bear-  
ings; countershaft on SKF self-align-  
ing ball bearings.  
Auto type pressed steel frame.  
Largest deck space ever provided on  
section motor car.



# FAIRBANKS-MORSE MOTOR CARS

*First on the rails — and still first*



## *New distinctive features* *The reason for this car's popularity*

Chain drive plus a fool-proof clutch that can't be burned out!

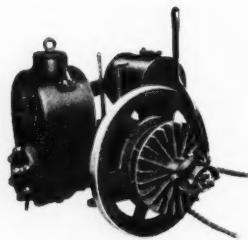
A sturdy, dependable car throughout, the Sheffield 44 with chain drive and indestructible clutch represents the biggest advance made in one-cylinder water-cooled section motor car construction. The important advantages of chain drive—the elimination of belt slipping and belt breaking—when coupled with manifest advantages of a clutch that won't burn out, afford dependability that is unequaled among motor cars of its class.

There is no sliding engine base to become rickety—no belt tightener—no "strong arm tactics" on the grades—no expensive delays for repairing broken belts while your men stand idle. The chain drive imposes known tension on the crankshaft that can be provided for in the design. Driving sprocket is located close to the flywheel, and as a result, distorted crankshafts, worn bearings and similar troubles are prevented.

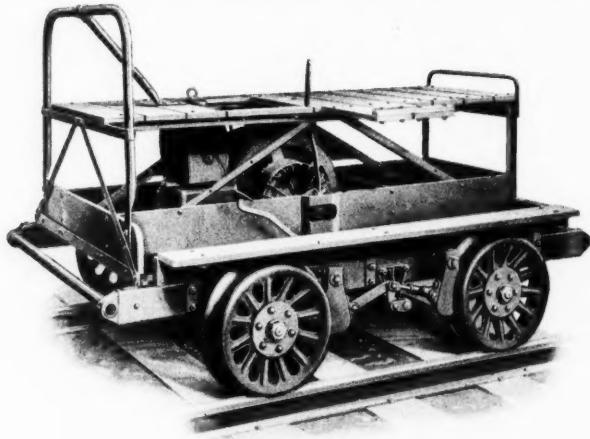
Let us put full particulars on this and other Fairbanks-Morse motor cars in your hands. Send for special bulletins on F-M section motor cars.

**FAIRBANKS, MORSE & CO., Chicago**

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; steam, power and centrifugal pumps; complete coaling stations.



This clutch—simple, fool-proof, easy to operate—is practically indestructible. It cannot be burned out



# FAIRBANKS-MORSE MOTOR CARS

*First on the rails — and still first*

A-944



# HACKMANN COMBINATION TRACK LINER



Two Step Base  
Weight, 20 lb.

**BEST BY TEST**

**SAVES 60% OF YOUR LABOR AND TOOL COST**

now in use on over

**100 RAILROADS**



Combination  
Tamping Bar

Combination  
Lining Bar

Seven Men Lining Switch with the Hackmann Combination Track Liner

HACKMANN TRACK LINERS CAN BE USED AT END OF TIES  
WITHOUT DISTURBING THE LOOSE RAIL OF THE SWITCH

## CONSERVE MAN POWER

### THE IDOL TRACK LINER

Can Be Used With Ordinary  
Lining Bars

*Write for Our Book of Instructions*

*We Will Gladly Demonstrate*

**SEE OUR EXHIBIT—BOOTH 224, COLISEUM**



Weight 32 lb.

## THE HACKMANN RAILWAY SUPPLY CO.

RAILWAY SAVING DEVICES—723 So. Wells St., CHICAGO, ILL.

FREDERICK HACKMANN,  
President and Mechanical Engineer  
J. J. FRANZEN,  
Secretary and Treasurer

LAUGHLIN & CHENEY  
Chicago, Ill.  
W. D. ACHUFF  
St. Louis

BALDWIN LOCOMOTIVE WORKS  
Foreign Representatives  
WM. ZEIGLER CO.  
Minneapolis, Minn.

THE HOLDEN CO. Ltd., Canada  
Toronto      Montreal      Winnipeg  
Vancouver

# NATIONAL RAILWAY

VISIT

The booth of

# RAIL JOINT PROGRESS

# THE RAIL JOINT COMPANY

WAY APPLIANCES ASSOCIATION  
ANNUAL EXHIBIT  
SEUM CHICAGO  
MARCH 8-9-10 and 11

You will find it

INTERESTING AND  
PROFITABLE

AN—61 Broadway, New York

# You are Invited....

to visit Spaces 130, 131, 132, 133 at the National Railway Appliance Exhibition, which will be held at the Coliseum, Chicago, March 8th to 11th, 1926.

POAGE Water Columns, with the new Universal Spout, ANDERSON Switch Stands and the ANDERSON Switch INTERLOCKER, that permits absolute switch safety, will be on display in these spaces.

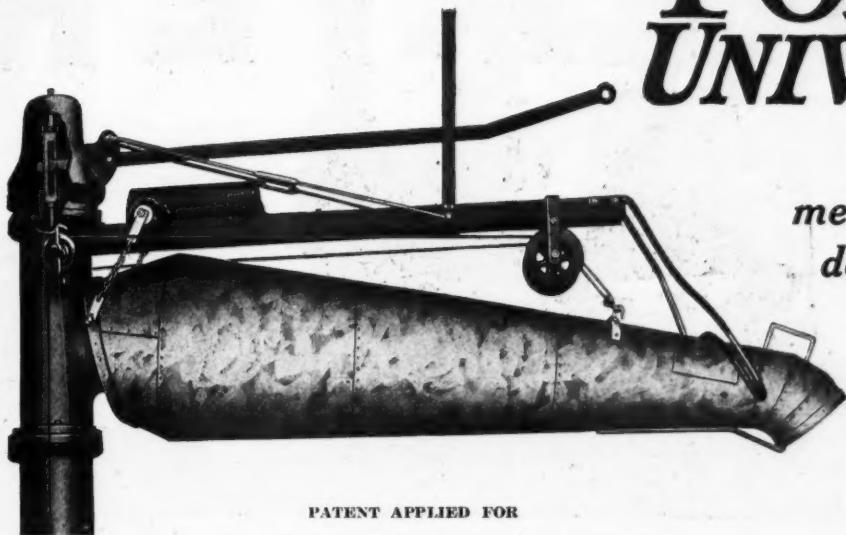
Competent engineers will be on hand to explain their operation in detail.

## The American Valve & Meter Co., Cincinnati, Ohio, U. S. A.

### Branch Offices:

Chicago, Ill., McCormick Bldg.	Boston, Mass., Essex Bldg.
St. Louis, Mo., Chemical Bldg.	Baltimore, Md., 724 E. Pratt St.
Denver, Colo., Barth Bldg.	Richmond, Va., Mutual Bldg.
Roanoke, Va., First Nat. Bank Bldg.	

# POAGE UNIVERSAL



*meets new water  
delivery conditions*

PATENT APPLIED FOR

The POAGE UNIVERSAL is a new Poage telescopic spout that will accommodate tenders with obstructions as high as 16 feet over rail and also deliver water to a tender with manhole but 8 feet over rail, without the least waste of water.

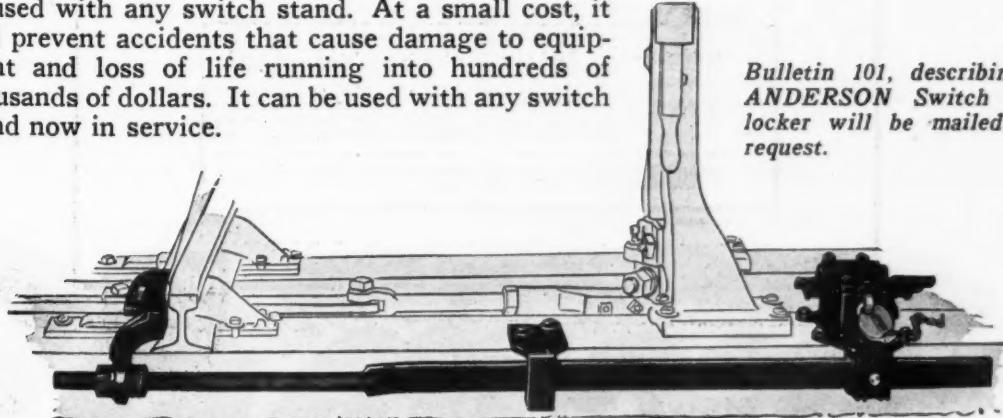
This extraordinary range, that will deliver water to the highest tender as well as the lowest, is not found in the Fenner or any other Telescopic spout.

*If you will send us your requirements for a spout with greater range, we will be glad to show you how the POAGE Universal will meet them.*

## ANDERSON <sup>switch</sup> INTERLOCKER

The ANDERSON Switch INTERLOCKER permits absolute switch safety. It is not a part of the switch stand and can be applied to any switch stand or used with any switch stand. At a small cost, it will prevent accidents that cause damage to equipment and loss of life running into hundreds of thousands of dollars. It can be used with any switch stand now in service.

*Bulletin 101, describing the ANDERSON Switch Interlock will be mailed upon request.*



**The American Valve & Meter Co., Cincinnati, Ohio, U. S. A.**

# CREATE R



M2 Section Car now standard equipped with S. R. B. safety railing.

## FAIRMONT RAILWAY MOTOR CARS

M19

M14

\*S2

\*M2 \*A2

Inspection Car for one man to four men.

Light Section Car for gangs up to six men.

Section Cars. Seating capacities from eight to twelve men. Pulling capacities up to fifty men.

\*ST2—MT2—and AT2 are corresponding models equipped with 2 speed transmission for extra heavy pulling.





Against winds, up grades, through snow drifts, under all operating conditions, Fairmont Motor Cars can be depended upon to handle bigger loads, insuring fewer trips and lower costs on all track maintenance work.

Many factors account for this greater power. Water cooling of the Fairmont ball-bearing engine by permitting lighter oils for lubrication, minimizes carbon deposits. Lubrication is automatic, as the oil is poured in mixed with the gasoline. There is always the right flow for the work being done. Protected against over-loading by the famous Fairmont three-bearing ball-bearing crankshaft, the Fairmont engine stands up better under long, heavy pulling.

Every ounce of power goes into the drive. The Fairmont air-cooled, endless cord belt transmission starts the car smoothly and surely, even with a full load. No "pushing off" or dangerous scrambling to get on. A touch of three fingers on the hand lever puts the belt drive in action.

The greater power, dependability and economy of Fairmont Cars can be proven on your road by dynamometer car tests. Have your Engineer of Tests write us. We will supply the dynamometer car and co-operate with him in making tests of the Fairmont and any other makes you have under consideration.

**FAIRMONT RAILWAY MOTORS, Inc., Fairmont, Minn.**

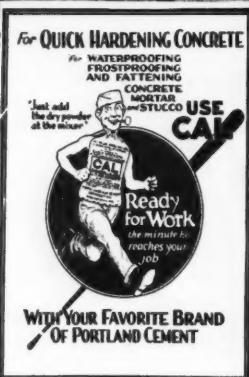
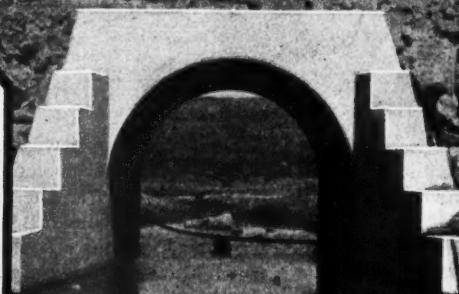
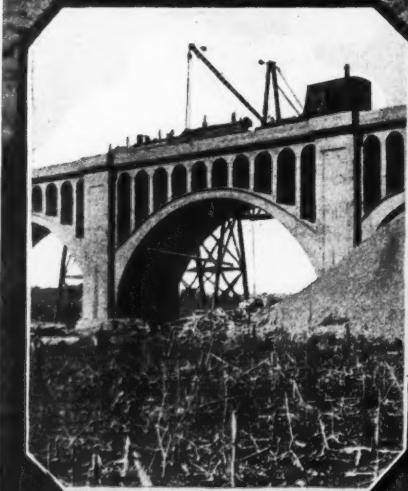
DISTRICT SALES OFFICES:

New York Chicago St. Louis San Francisco Washington, D. C. Winnipeg, Canada

# fairmont

# CAL

is setting  
standards



North American  
Successor to Security  
Hagerstown

Washington

# Setting new time saving standards in all concrete work

To railroads quick use of the finished job means resumed operations and maximum economy

**A**s an admixture for all Portland cement, Cal removes one of the greatest retarding factors against the more extended use of concrete for permanent railway construction.

The delay occasioned by the natural curing time necessary to obtain proper concrete strength is reduced more than 50% efficiently and economically by the use of Cal. In addition Cal possesses the unusual combined properties of being able to fatten, harden, densify, waterproof and frostproof all Portland cement.

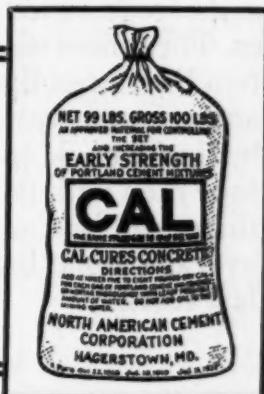
Cal gives quick strength—accelerating the set of concrete by chemical action and by permitting the use of a drier mix, which, however, is extremely workable where used in forms.

As a ready prepared white powder Cal is easily applied on the job at the mixer—it requires no skill—its visibility prevents omission or double treating, being a time tested product of one of the largest manufacturers of Portland cement in the country, its results and safety are well vouched for.

Booth 285

n (ement Corporation  
Security Cement and Lime Co.  
Hagerstown, Maryland  
Baltimore

Albany





## LABOR SAVING DEVICES



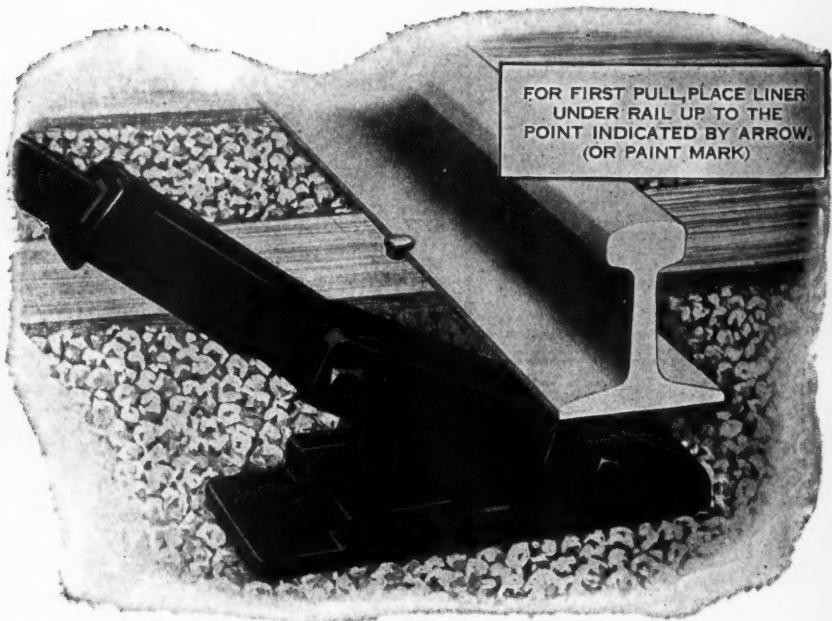
### BUDA MOTOR CARS Save Time and Bring Men Fresh to Their Work

Buda Friction Driven Railway Motor Cars, based on performance over a period of years, combine lowest maintenance with economical operation together with correct design and a high standard of quality.

You purchase Buda Friction Driven Railway Motor Cars with entire confidence in a product borne of sound engineering and fully sustained by its record of successful performance.

### THE BUDA-CLARK TRACK LINER Will Line Track With the Least Expenditure of Time and Energy

The Buda-Clark Track Liner can be used successfully under any ballast conditions, cinder, rock, stone, etc., for lining rails, frogs, switches. Three men with two liners can line any average gravel ballast track and four men with two liners can line any average stone ballast track.



## BUDA-HUBRON EARTH DRILL

will dig a post hole 22 inches in diameter 6 feet deep in 3 minutes.

Digs in Earth, Clay, Shale, Hardpan, etc.

Operated by a Buda Gasoline engine.

Mounted on frame of Drill.



## BUDA NEW IMPROVED BALL BEARING JOURNAL JACK

### Special Features

- Light in Weight
- More Rise per height
- Less Power to Lift Load
- Capacities 25-35-50 tons

## THE BUDA COMPANY

HARVEY (Chicago Suburb) ILLINOIS

30 Church Street  
NEW YORK

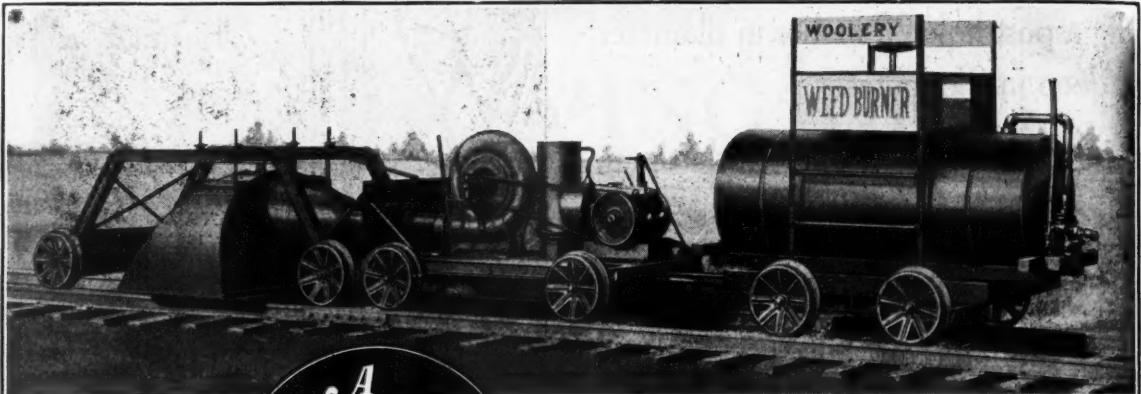
Railway Exchange  
CHICAGO

Railway Exchange  
ST. LOUIS  
LONDON

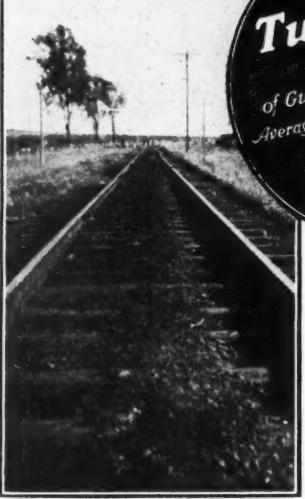
664 Mission St.  
SAN FRANCISCO

405 West Forsyth St.  
JACKSONVILLE

## Clean Your Track of Weeds for \$3.00 per Mile With a Woolery Railway Weed Burner



Patent Applied For



A Two-Man Outfit  
of Guaranteed Efficiency  
Average cost on first heavy burning  
less than  
\$3.00 per mile

**Thousands of miles have been  
done at about this figure**

Gets rid of weeds CHEAPER than any other known method or device.

Consumes the vegetation without any damage to sound ties.

Completely cleans track of weeds without leaving a film of oil on the rails.

Only ONE large atomizing Burner—guaranteed entirely free from clogging.

Burns the lower grades of distillate oil.

Fire starts instantly—no generating.

The refractory lined hood conserves the heat and directs it down on the weeds with maximum effect.

Operated by TWO MEN.

Operator has complete control of the outfit and a clear view of the track in both directions. He can regulate both the speed of the machine and the size of the fire according to the vegetation.

The Weed Burner can travel at any speed from 1 to 6 miles per hour for burning and up to 20 miles per hour for traveling.

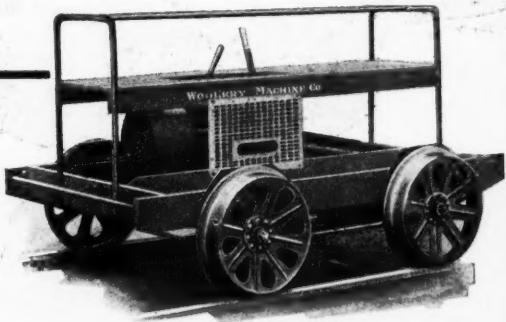
It can be removed from track at a highway crossing.

*Ask for a demonstration and prove for yourself the savings to be made on YOUR Road.*

### The Woolery (Model M) Railway Motor Car

*Light Weight but 100 Per Cent Overload Capacity*

A car for every road—for any Climate—for all kinds of Service. Power to meet requirements. It can be used as Section Car, Extra Gang Car or Small Work Train. Normal Capacity, 10 passengers. Instantly removable side seats which increases the seating capacity to 20 men, can be supplied. Chrome Nickel Steel Ball-Bearing Axles. Steel Hand Railing and Lift Handles, Steel Engine and Wheel Guards. Steel Truss Frame contributes enormous strength.



See our new Heavy Duty Steel Frame Motor Car at our Exhibit Spaces 231-2-3

**Woolery Machine Co., Minneapolis, Minn.**



This Fairmont car equipped with Hyatt journal bearings—cuts the cost of maintenance of way.

## Ten Years of Satisfaction —not one cent spent for maintenance

THIS Fairmont propelled motor car was placed in service in 1916 on the Chicago & Northwestern R. R.

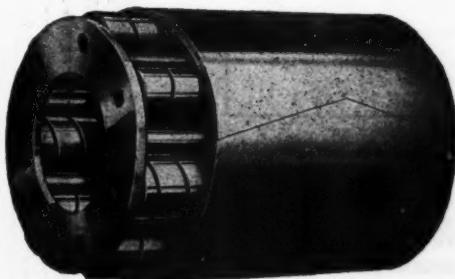
Since then it has been in continuous daily operation. It has travelled a distance conservatively estimated at 25,000 miles—hauling members of the section crew, tools and trailers.

Hyatt Roller Bearings in the journal boxes roll as easily now as the day they were installed, ten years ago. The only attention they have ever required has been lubrication every 3 or 4 months. Not one cent has been spent for bearing maintenance.

Fairmont Railway Motors, Inc. and other prominent car builders, adopted Hyatt journal bearings many years ago.

Railroad men specify Hyatt equipped cars, not alone because they save 30% on gasoline consumption and 80% of lubrication expense—but because they operate efficiently without attention. In the out-of-way places such service is invaluable.

**HYATT ROLLER BEARING COMPANY**  
NEWARK DETROIT CHICAGO SAN FRANCISCO  
WORCESTER PHILADELPHIA PITTSBURGH  
CLEVELAND CHARLOTTE



**H Y A T T**  
**ROLLER BEARINGS**

# JORDAN SPREADER

The Composite Spreader-Ditcher, which is the Jordan Spreader with the composite Spreader-Ditcher Attachment, performs all the functions of the Spreader (moves earth, spreads bulky materials, plows snow) and in addition will shape ballast and subgrade, form new ditches or clean old ones, and trim the banks of cuts to a uniform slope.



An all-year Machine. In use on  
North America's leading railroads.

*Write for Copy of New Catalog*



## District Sales Agencies:

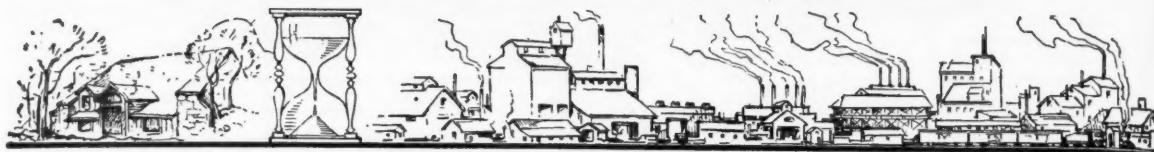
Philadelphia, Pa.  
Pittsburgh, Pa.  
Cleveland, Ohio  
Detroit, Mich.  
St. Paul, Minn.  
Omaha, Nebr.  
St. Louis, Mo.  
Kansas City, Mo.  
Joplin, Mo.  
Atlanta, Ga.  
Birmingham, Ala.  
Jacksonville, Fla.  
New Orleans, La.  
Roswell, N. Mex.  
Denver, Colo.  
Salt Lake City, Utah  
Phoenix, Ariz.  
Los Angeles, Calif.  
Charlotte, N. C.  
Calgary, Alta., Can.  
Edmonton, Alta., Can.

Naturally, there are a good many local conditions that affect the choice of a pump, but there must be some reason why so many engineers insist that no matter what the *type* of centrifugal used—it must bear the name plate of The American Well Works.

### THE AMERICAN WELL WORKS *General Office and Works—Aurora, Illinois*

## BRANCH OFFICES:

Chicago, Ill.....	First National Bank Bldg.
Milwaukee, Wisc.....	Wisconsin National Bank Bldg.
New York, N. Y.....	165 Broadway
Dallas, Texas.....	Western Indemnity Bldg.
San Francisco, Calif.....	635 Mission St.



MAKERS OF POWDERS SINCE 1802

The oldest du Pont powder mill—  
built in 1802

## Leadership

Leadership is measured by service.

For nearly a century and a quarter, the du Pont name has signified leadership in explosives manufacture on this continent.

Paralleling the rapid growth of American industry, du Pont has developed explosives to meet new needs and solve new problems that industry might be served.

Thus has it been the privilege of du Pont to contribute a share in the industrial expansion of the Republic.

E. I. DU PONT DE NEMOURS & CO., Inc.  
*Explosives Department*  
WILMINGTON, DELAWARE



Partial view of Repauno Plant,  
one of the largest explosives  
plants of the du Pont Company.

123 YEARS OF LEADERSHIP IN THE SERVICE OF INDUSTRY

## Let the trackman judge

**W**E have built the Verona shovel exclusively for the trackman. Let him be its judge.

Ask him if he likes it. He will tell you that it is easy to use for tamping and shoveling — kind to his hands and back and shoulders.

And let him judge it without giving a verbal opinion. Let his work talk for him. Note the increased amount of shoveling he accomplishes when he uses a shovel he likes.

Note too, how much longer the Verona shovels last. No other praise could be so eloquent.



### VERONA TOOL WORKS

Pittsburgh • New York • Chicago • Boston • St. Louis  
San Francisco • New Orleans • Washington • St. Paul  
Denver • Baltimore • Louisville

# VERONALLOY



## VERONALLOY

### It's New!

It has taken two years to develop it—two years of experimentation and tests under the direction of Professor F. F. McIntosh, former head of the Metallurgical Department of the Carnegie Institute of Technology. In these tests every possible alloy was used. The entire field of possible alloys was completely exhausted and the chisel now being manufactured was selected by comparison with every conceivable steel.

The new chisel will do approximately five times the work of our best carbon chisel. It can be re-ground, re-dressed and re-tempered in the ordinary railroad roadmaster's blacksmith shop. Although the cutting edge has a hardness heretofore unequalled, the head is so soft that ordinary spike mauls and sledges can be used without being injured.

Try this new Veronalloy Chisel. Each chisel is wrapped in wax paper and packed in wooden boxes—one dozen to a box.

VERONA  
TOOL  
WORKS



Western Dump Cars in Rock Work on Santa Fe

## Cheaper for the Company Easier for You

WONDERFUL labor-savers—Western air dump cars. They pay for themselves in labor saved compared with old methods—and they do more than that.

Western air dump cars would make it easier for you to keep up your road bed and maintain your ditches. They would make it easier for your men. Your men could move more dirt. Give experienced men the choice between WESTERNS and other cars, and they will take Westerns every time. Ask them; they know.

### All-Purpose Cars

They are all-purpose cars—ditching, double track work, new construction, cinder disposal, snow disposal, coal shortage and a variety of other uses—more than paying their way every time.

### Keep the Ballast Clean

The 20-yard and 30-yard sizes are favorites for railroad use. Equipped with steel aprons, that act automatically to throw their load beyond the ballast, they meet every requirement for railroad service.

May we refer you to enthusiastic users of these labor-saving air dump cars?

*If you are not in a position to buy, we sometimes can make a rental proposition giving you use of air dump cars without adding to your capital account.*

**Western**

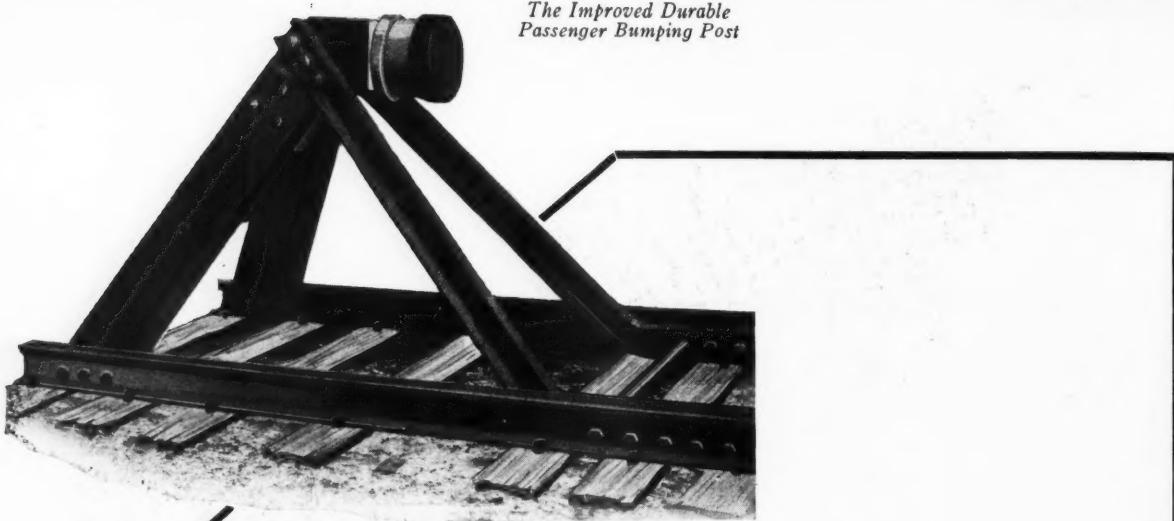
***That's Why***

**WESTERN WHEELED SCRAPER COMPANY**

*Founded 1877*

Earth and Stone Handling Equipment  
**AURORA, ILLINOIS**

*The Improved Durable  
Passenger Bumping Post*



## Durable Posts for Passenger and Freight Service

THE Durable Bumping Post is available for passenger service as well as freight.

The improved Durable Passenger Bumping Post is similar in every respect to the freight post except that (like the well-known Ellis design) it is equipped with a rubber cushion. This absorbs the impact from ordi-

nary blows, and thereby minimizes the shock to passenger cars.

These Durable Posts are all-steel, are entirely above the ground, occupy minimum track space, and are composed of few parts simply combined.

They are standard on many leading roads. If yours is not among this number, let us give you further details.

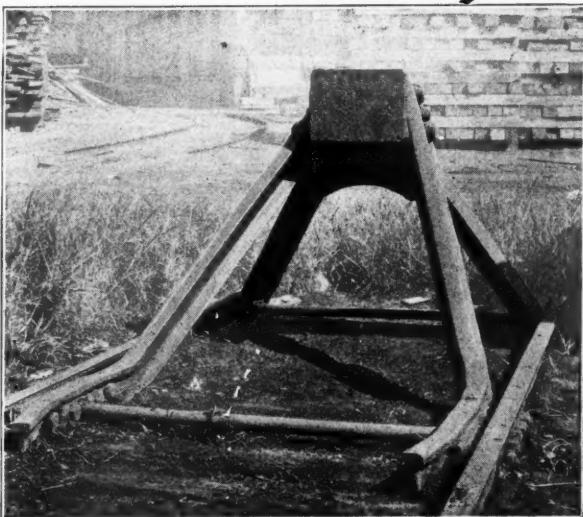
### MECHANICAL MANUFACTURING COMPANY

*Also manufacturers of  
the Ellis Bumping Post*

Pershing Road and Loomis Street,  
Chicago, Ill.

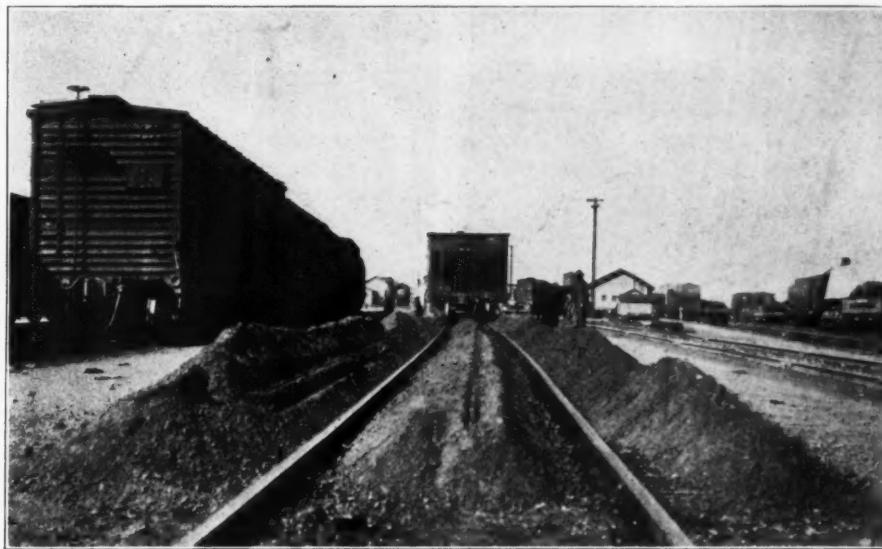
Room 323-E  
Hudson Terminal Bldg.  
New York, N. Y.

*The Standard Durable  
Freight Bumping Post*



## THE HART SELECTIVE BALLAST CAR IT CANNOT FLOOD THE RAIL

MAXIMUM



VERY HEAVY DISTRIBUTION TO CENTER AND BOTH SIDES SIMULTANEOUSLY

MINIMUM

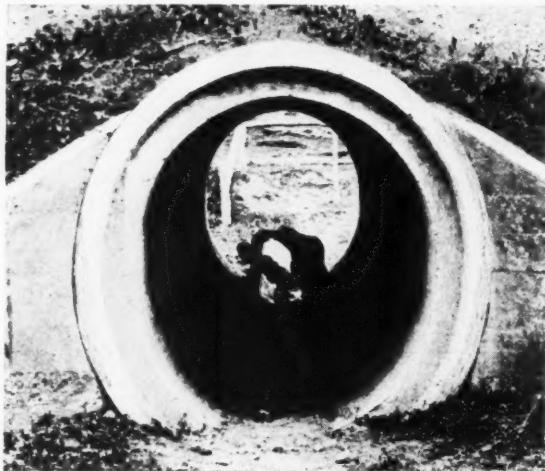


VERY LIGHT DISTRIBUTION TO CENTER AND BOTH SIDES SIMULTANEOUSLY

Places ballast material in the proper quantity just where it is needed, without flooding the rails.

*We shall be glad to furnish particulars.*

**RODGER BALLAST CAR COMPANY**  
523 Railway Exchange, 80 E. Jackson Blvd.  
**CHICAGO**



Cattle Passes of 84 inch by 89 inch precast reinforced concrete pipe, are easily laid, economical, and require no maintenance.

**Specialists  
in permanent precast  
reinforced concrete products  
for railway use**

Concrete culvert pipe in all standard sizes from 12 inches to 84 inches is available for prompt delivery from a nearby plant.

# MASSEY

**CONCRETE PRODUCTS CORPORATION**

**Peoples Gas Building, Chicago.**

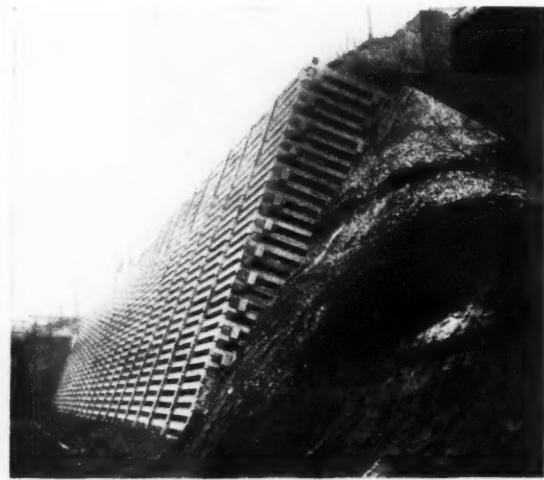
*Sales Offices.... New York, Atlanta, Cincinnati,  
St. Louis, San Francisco, Los Angeles.*

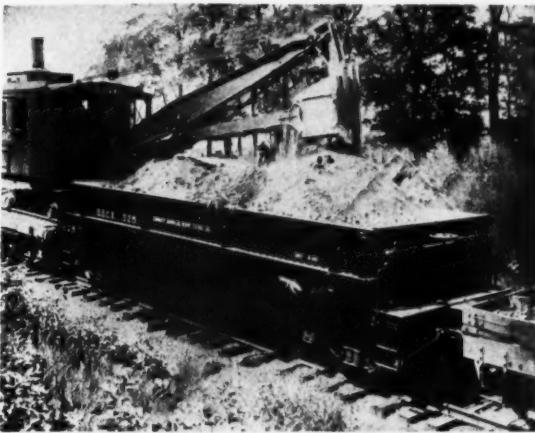
**CANADIAN CONCRETE PRODUCTS CO. Ltd.**

**Transportation Building  
Montreal**

Concrete cribbing for retaining walls is permanent, economical, and can be laid without any handling equipment.

Concrete piling of maximum strength is produced by the ideal factory conditions in Massey plants.





Differential Air Dump Car being loaded full length with standard dumper.  
Capacity level full 24 cubic yards, crown load 36 cubic yards.



Note how the load is cast well beyond the ballast. The full sized ends to the doors prevent material from falling back onto the ballast.

## LABOR IS COSTLY—SAVE IT USE DIFFERENTIAL AIR DUMP CARS

They load full length with standard dumper.  
No half-loaded cars and no "swapping ends."

They dump load beyond ballast line and the full sized sector plates on the ends of the door prevent any of the load from falling back and fouling the ballast.

They dump quickly to either side but the speed of dumping is accomplished without destructive shock.

They have clear discharge opening. Door folds down into same plane as floor. Material of any size can be dumped.

A steep discharge angle (nearly 50°) insures clean dumping of sticky material.

Each car carries an air reservoir of sufficient capacity to dump the car. This reservoir can be charged, while car is being loaded or is in transit, from either the dump line or the train brake line.

Their superior operating features more than justify Differential Air Dump Cars. Consider also the following mechanical features:

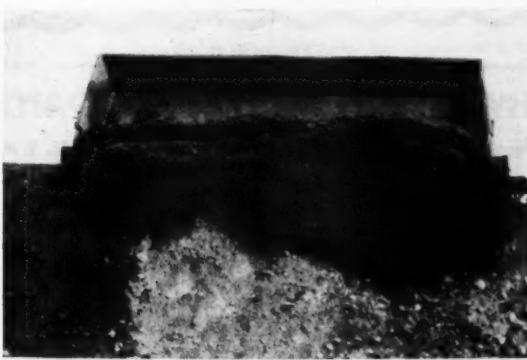
Differential cars are of all steel construction and are marvels of simplicity.

The floor plate is supported at intervals of only 8 3/4" by lateral beams.

The car body rides on four points directly over the bolster side bearings, giving great stability.

There is no locking mechanism to get out of order.

*These features, so conducive to long life and low maintenance, caused several of the Iron Mines of Northern Minnesota to adopt Differentials to work under their ten yard shovels in what is acknowledged to be the most severe dump car service in the world.*



Dumps quickly and surely in either direction. The load is given a definite throw by the action of the body but does not suffer from destructive shock.

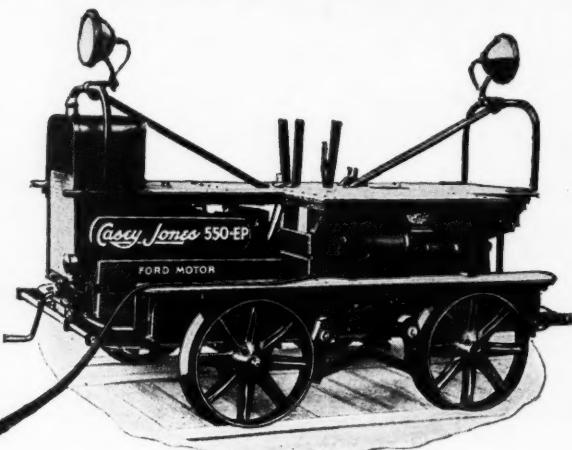
THE  
DIFFERENTIAL  
STEEL CAR COMPANY

FINDLAY, OHIO

# GAS-ELECTRIC POWER CAR

*Casey Jones* 550-EP

A COMPLETE POWER PLANT  
FOR ELECTRIC TRACK TOOLS



## Standard Ford Motor

EQUIPPED WITH GOVERNOR AND WATER CIRCULATING PUMP

7½ K.W. UNIVERSAL GENERATOR

*Supplies either direct or alternating current at 110 volts and will operate any standard electric motor driven appliance within its capacity, 7½ K.W.*

**Tamping track**—will operate 12 Jackson Electric Tie Tamers for extra gang use.

**Bridge construction and repair**—will operate tools for drilling either steel or wood, scoring ties, grinding and tool dressing, rail and timber saws.

**Rail cutting in or out of track**—will operate a battery of ten Racine Rail Saws for cutting off battered rail ends.

**Rail drilling**—will operate electric rail drills of 1½-inch capacity, also bonding drills for signal service.

**Changing angle bars**—will operate nut wrenches for removing or tightening angle bar nuts.

**Flood lighting**—will operate flood lights for emergency jobs as washouts, wrecks, etc.

**Motor car**—will transport with trailers up to 70 men or an equivalent load of materials to and from the job. Requires no special foundation but can be set off by four men on a standard motor car set-off.

### REGIONAL BRANCH OFFICES

**WASHINGTON, D.C.**

**NEW YORK**

**CHICAGO**

**BIRMINGHAM**

**ST. LOUIS**

**ST. PAUL**

**SAN FRANCISCO**

**PORTLAND**

**FOREIGN**

**W. NEWTON JEFFPRESS, INC.**  
EASTERN EXECUTIVE 1319 P STREET N. W.

**SHARFFNER & ALLEN**  
50 CHURCH STREET

**OTIS B. DUNCAN**  
53 W. JACKSON BOULEVARD

**A. A. CULP**  
239 BROWN-MARX BLDG.

**WM. J. ROEHL**  
RAILWAY EXCHANGE

**RANK & GOODELL**  
906 MERCHANTS BANK BLDG.

**W. H. WORDEN CO.**  
122 PINE STREET

**WESTERN RAILWAY SUPPLY CO.**  
15th & JOHNSON STS.

**Koppel Industrial Car & Equip. Co.**  
KOPPEL PR. EXCLUSIVE EXPORT AGENTS

### NORTHWESTERN MOTOR COMPANY

FACTORY and GENERAL OFFICE ... EAU CLAIRE, WIS., U. S. A.

**Casey Jones**  
REG. U. S. PAT. OFF.

MANUFACTURERS—RAILWAY MOTOR CARS



## A 12 TAMPER GAS-ELECTRIC POWER CAR

For Year 'Round Use Before, During and After the Tamping Season

### USES AS A POWER PLANT

**Tamping track**—will operate 12 Jackson Electric Tie Tamers for extra gang use.

**Bridge construction and repair**—will operate tools for drilling either steel or wood, scoring ties, grinding and tool dressing, rail and timber saws.

**Rail cutting in or out of track**—will operate a battery of ten Racine Rail Saws for cutting off battered rail ends.

**Rail drilling**—will operate electric rail drills of  $1\frac{1}{2}$ " capacity, also bonding drills for signal service.

**Changing angle bars**—will operate nut wrenches for removing or tightening angle bar nuts.

**Flood lighting**—will operate flood lights for emergency jobs as washouts, wrecks, etc.

*Supplies either direct or alternating current at 110 volts and will operate any standard electric motor driven appliance within its capacity,  $7\frac{1}{2}$  K.W.*

As a work car—will transport with trailers up to 70 men or an equivalent load in materials at speeds of 5 to 30 miles per hour.

Light in weight, the car may be removed from the track by four men. It does not require a special foundation when operating as a power unit, but is placed on a standard motor car set-off.

This car is manufactured and guaranteed by the Northwestern Motor Company, Eau Claire, Wisconsin, the electrical apparatus being supplied by the Electric Tamper & Equipment Company.

# ELECTRIC TAMPER & EQUIPMENT CO.

RAILWAY EXCHANGE

CHICAGO, ILLINOIS



# THE OXWELD RAILROAD SERVICE COMPANY

*representing*

**THE LINDE AIR PRODUCTS CO.**  
**(Linde Oxygen)**

**THE PREST-O-LITE CO., Inc.**  
**(Prest-O-Lite Acetylene)**

**UNION CARBIDE SALES CO.**  
**(Union Carbide)**

**OXWELD ACETYLENE CO.**  
**(Oxweld Apparatus and Supplies)**

Railway Exchange  
Chicago

30 East 42d Street  
New York



*Visit the distant  
pump house—  
ONCE A MONTH!*



Patents Pending

**Control Water Supply With an Electric Switch**

By providing a self-lubricating pump that requires attention but once a month, GARDNER has solved the problem of remote control of water supply. Your pump house can remain locked 29 days of the month, while the water supply is controlled from your office.

The GARDNER Enclosed Power Pump is automatically flood-lubricated from one reservoir, like an automobile motor. It saves a tremendous amount of time and trouble; and perfect lubrication insures long life. Ideal for railroad water supply. Ask for descriptive Bulletin.

*"Quality Builders for More Than 65 Years"*

**THE GARDNER GOVERNOR COMPANY**

Quincy, Illinois



CHICAGO  
549 Washington Blvd.

NEW YORK  
534 Singer Bldg.

PHILADELPHIA  
604 Arch St.

SAN FRANCISCO  
401 Rialto Bldg.

HOUSTON  
1242 Heights Blvd.

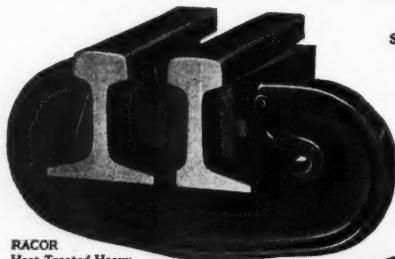
LOS ANGELES  
2122 E. 7th St.  
6811 S. Alameda St.

LONDON  
25, Bishopsgate, E. C. 2

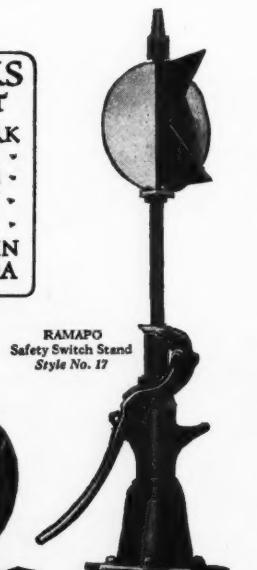
# GARDNER

# RACOR

**SEVEN WORKS**  
RAMAPO-AJAX-ELLIOT  
HILLBURN, NEW YORK  
NIAGARA FALLS, N.Y.  
CHICAGO, ILLINOIS  
EAST ST. LOUIS, ILL.  
PUEBLO, COLORADO  
SUPERIOR, WISCONSIN  
NIAGARA FALLS, CANADA



RACOR  
Heat Treated Heavy  
Duty Guard Rail Clamp



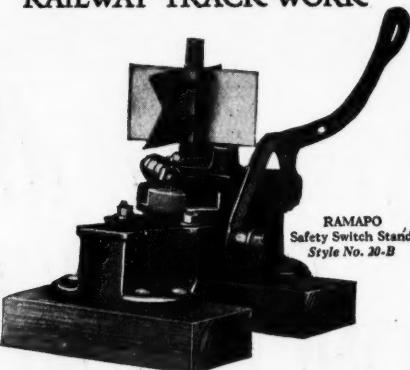
RAMAPO  
Safety Switch Stand  
Style No. 17



RACOR  
Drop Forged  
Rail Brace

RACOR  
Adjustable  
Rail Brace

AJAX MANGANESE  
One-Piece  
Guard Rail



RAMAPO  
Safety Switch Stand  
Style No. 20-B

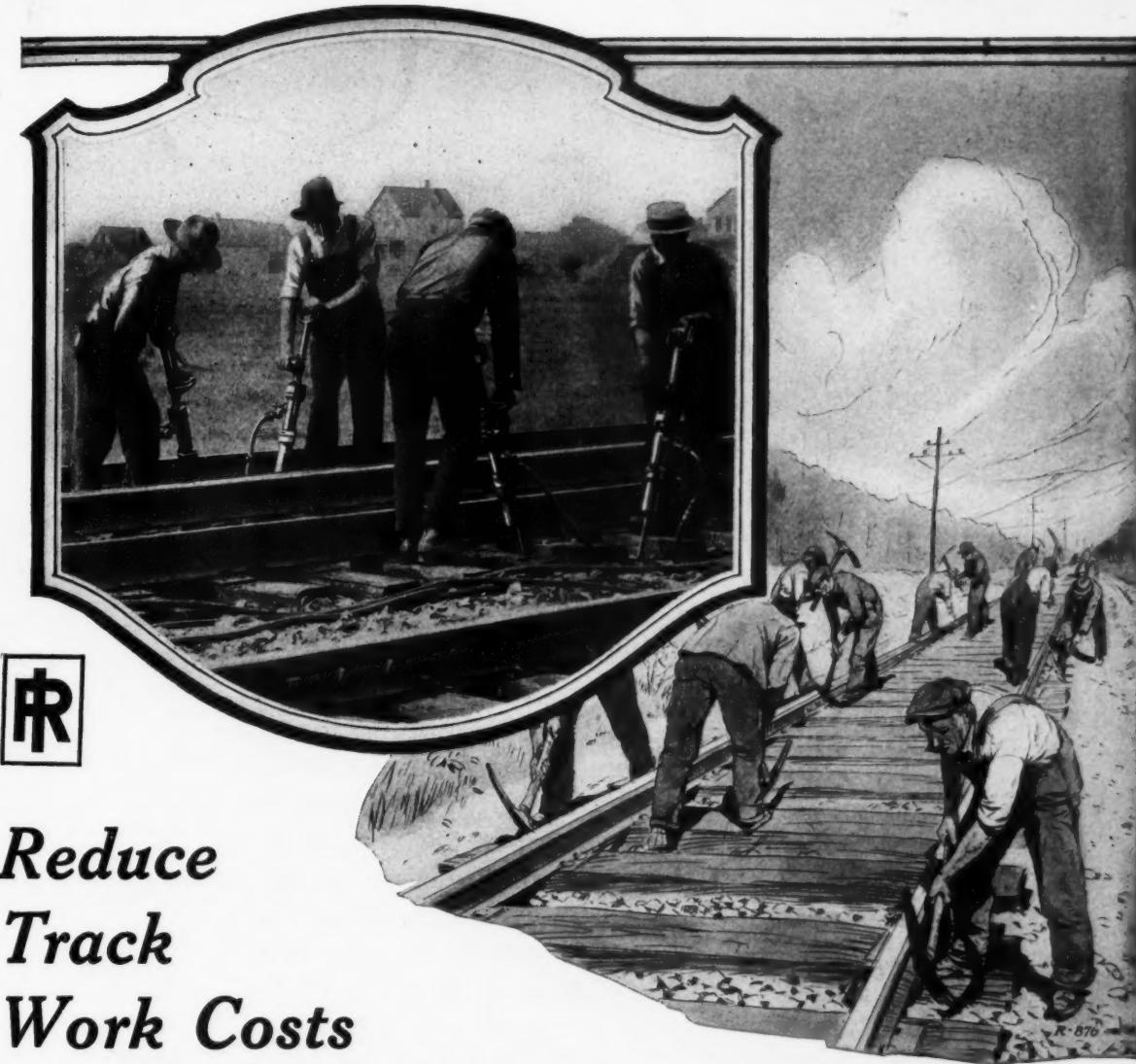


EUREKA ADJUSTABLE  
Open Side Switch Clip

**Main Office - HILLBURN, NEW YORK**  
SALES OFFICES AT WORKS, ALSO  
30 CHURCH STREET, NEW YORK  
MCCORMICK BUILDING, CHICAGO

# RAMAPO AJAX CORPORATION

# Pneumatic Tie Tampers



*Reduce  
Track  
Work Costs*

They tamp more track with less labor and in less time. Four men with these tools will tamp more track in one day and do a better job than sixteen men with picks or bars. Actual records show pneumatic tampers make a smoother, safer and more permanent roadbed which lasts on the average of two to three times as long as hand tamped track.

Pneumatic Tamping Outfits are a quick means for reducing costs of track work. The tamper compressor is a handy portable power plant which can be used to operate a variety of labor aiding track tools at other times when not used for tamping.

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

*Offices in principal cities the world over*

FOR CANADA REFER—CANADIAN INGERSOLL-RAND CO. LIMITED, 260 ST. JAMES STREET, MONTREAL QUEBEC

# Ingersoll-Rand



## Bell and Spigot Joint

THE Bell and Spigot Joint for Cast Iron Pipe adopted over one hundred years ago, is the preferred joint today.

It is tight, flexible, easily made and non-corrodible—there are no bolts to rust out—it makes changes of alignment or insertion of special fittings a simple matter—it can be taken apart and the pipe used over again, without any injury—it is not subject to damage in transit—in fact, it embodies practically all of the desirable qualities in an underground joint.

THE CAST IRON PIPE PUBLICITY BUREAU, Peoples Gas Building, Chicago

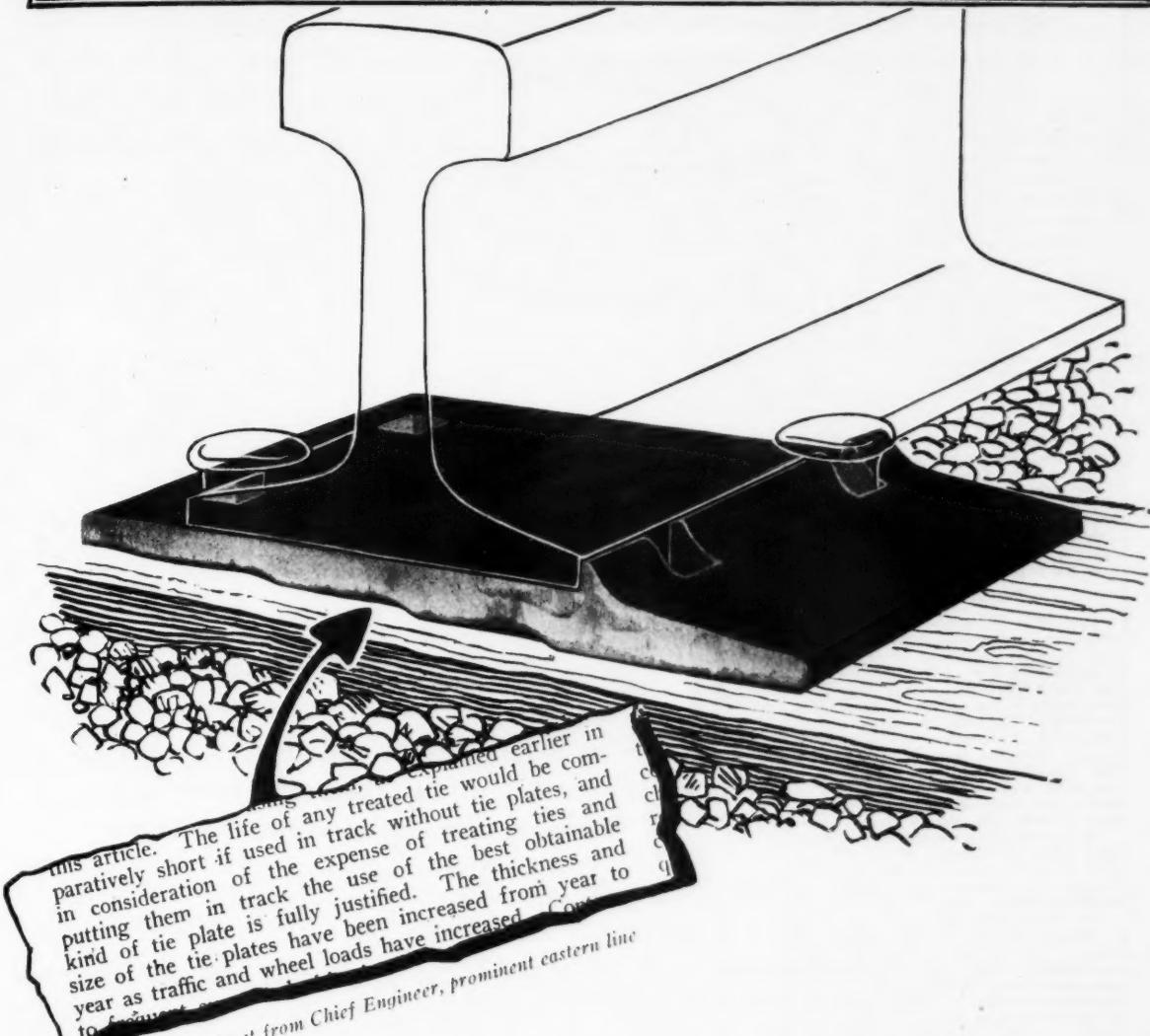
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**STAR, WASHINGTON, D. C., THURSDAY, DECEMBER 17 1925**

## **INSURANCE RATE CUT OFFERED IF WATER PRESSURE IS RAISED**

### **Underwriters Propose 5 Per Cent Reduction as Inducement to Installation of New System Long Sought for City.**

As an inducement for installation of a high-pressure water system in the National Capital, the Board of Fire Underwriters here, which represents all the fire insurance companies in the country, has decided to reduce the premium rates on downtown property 5 per cent if the system is installed.

This offer, which has just been decided upon by the Board of Fire Underwriters, will cover all property within the area proposed for a high-pressure water system—namely, from K street to the Mall and from North Capitol street to Nineteenth street, and will affect about \$250,000,000 worth of private insurable property. If the high-pressure water system is not placed in downtown Washington, however, the National Board of Fire Underwriters, which has already made preliminary steps for its survey of conditions here, will not only be unable to reduce the rates, but, in the opinion of experts, will unquestionably have to raise them considerably.

#### **Praise Proposal.**

The offer to reduce the insurance rates here is considered by David Lee, chairman of the board of trade's insurance and fire protection committee which has advocated a high pressure system for 23 years, as a clear indication that the insurance companies of the country are concerned in the situation here. Mr. Lee and his committee feel that the offer is the most important development that has taken place since the high-pressure system has been advocated.

The committee regards this action as a plain inducement to the officials and business men of the National Capital to "remedy a serious and acute condition here."

Approximately \$3,102,000 was paid in fire premiums in the District last year. Half of this amount was paid on property within the proposed high-pressure area. A reduction of 5 per cent would mean a saving of \$75,000. If the system is not installed it will mean a raise in rates greater than the proposed reduction and the business men will not only lose \$75,000 but probably will pay more than that in increased premiums. If the high-pressure system is installed, it is pointed out by the committee, the

money saved soon would pay for the installation of the system and the lives, property and inconvenience incident to a blaze would at the same time be protected. In addition to this the Government would have a vastly greater protection for its buildings and irreplaceable records which are not insured by private concerns.

The Board of Trade, which somewhat irked recently covered that it would be appropriate system be installed.

Bureau of the Budget, Mr.

**"...the money saved would soon pay for the installation of the system"**

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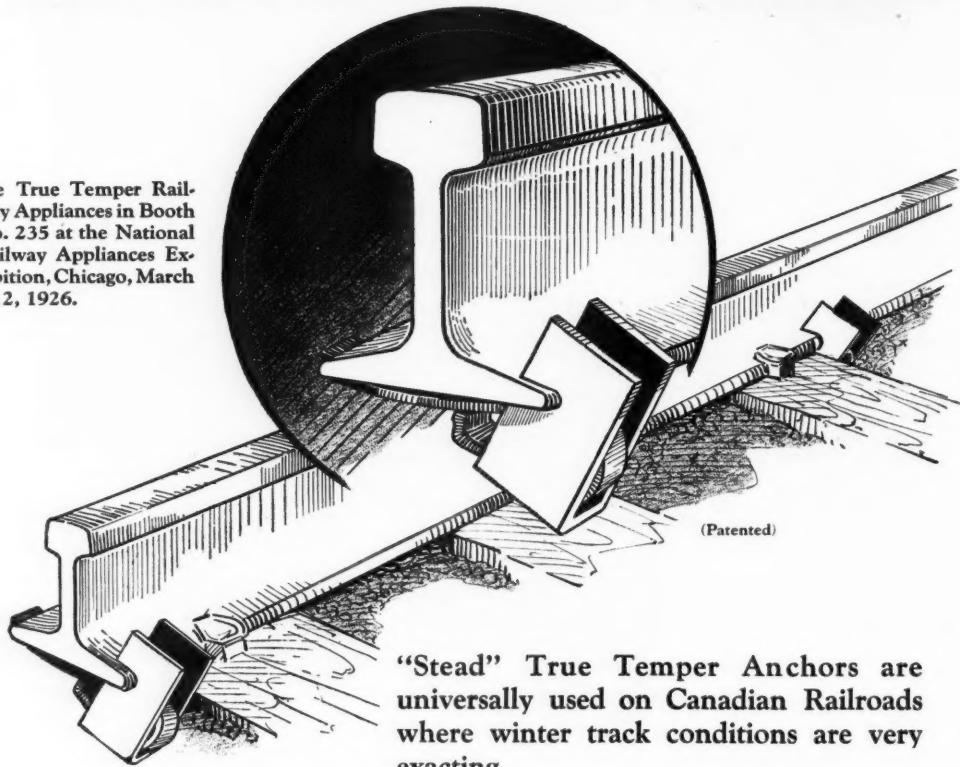
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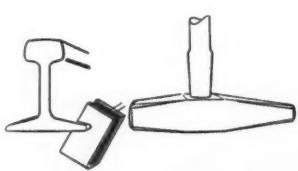
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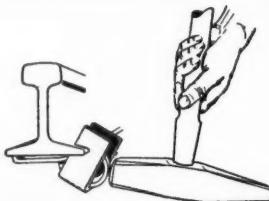
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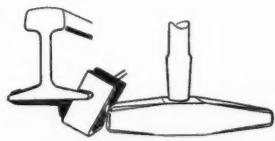
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# Railway Engineering and Maintenance

Volume 22

March, 1926

Number 3

## IS WINTER WORK ECONOMICAL?

**M**ORE maintenance of way work is being done this winter than ever before, in fact the amount has been increasing steadily for several years. This indicates that those roads that have tried this method have found it beneficial. On the other hand, many, perhaps most, maintenance men believe that the prosecution of any considerable amount of work during the winter is impractical on the northern roads. When such a wide difference of opinion prevails it is important that facts be collected to prove the success or the impracticability of the plan.

For the purpose of drawing out these facts from actual operation we have announced a contest on The Practicability of Increasing the Amount of Work That Can Be Done in Winter. For this contest we solicit discussions of all the various phases of this subject, bringing out the limitations and the disadvantages as well as the advantages as shown by actual demonstration. While abstract discussions of this subject will be welcome special consideration will be given by the judges to those contributions that contain information drawn from actual experience. To stimulate interest in the subject, prizes of \$35 and \$25 will be paid for the first and second best papers submitted, respectively, the awards being based upon the practical value of the information incorporated. All other contributions accepted and published will be paid for at our regular space rates. All contributions should be sent to the editor of *Railway Engineering and Maintenance*, 608 South Dearborn street, Chicago, and must be received on or before April 1 to be considered by the judges.

## LABOR SAVING DEVICES AS AN ANTIDOTE FOR LABOR SHORTAGE

**W**ITH the restrictive provisions of the present immigration laws and the likelihood that these provisions will not be modified in the near future to admit materially larger numbers of foreign laborers, little promise is held out that the supply of railroad labor will increase so long as the industrial activities of the country continue at their present pace.

Such a situation emphasizes the value of labor saving devices, since the ability to perform contemplated work is often as important as the savings in cost effected by these devices. A road with an equipment of efficient mechanical adjuncts for track work and with men trained to operate them can usually face a labor shortage of any but the most acute proportions with equanimity.

The mere possession of the machines will not in itself insure savings in either money or men; intelli-

gent supervision, operation and maintenance must be provided if the proper result is to be obtained. Time and money expended in instruction regarding the proper operation and repair of the devices will be returned many fold in the savings effected by their use.

Labor saving devices divide themselves into two classes: those which are assigned permanently to the section forces, and those designed for special work with extra gangs or for work over an entire division, the latter including such units as power ditchers, weed burners or other weed eradicators and the like. With the latter type of equipment, the work should be carefully scheduled, so that the machines may be kept continuously in service, not only to reduce overhead expenses by obtaining the maximum use from them but also to secure the benefits arising from the ability to keep experienced operators continuously in charge.

## WHY A LABOR-SAVING NUMBER?

**O**NE of the measures of the civilization of any period or of any race is the value placed on human labor. History of ancient times contains many stories of monumental structures erected with utter disregard of human effort, requiring the toil of countless thousands of slaves. As the human race progressed in its development, however, such wanton use of labor disappeared, although in China and some other Oriental countries it is still regarded as of so little value that one is not warranted in incurring any appreciable expenditure to conserve it.

In those countries in which civilization has made most rapid progress it has been impelled by the desire for higher standards of living. To meet these standards increased per capita production has been necessary. To enable this to be realized mechanical aids have been developed to permit each worker to employ his labor more effectively.

The railways are among the large employers of labor, enrolling more than one and three-quarter million persons in their service. Of these more than 400,000 are engaged in the maintenance of tracks and structures. In many branches of railway service, as in the transportation department, marked progress has been made in increasing the output per employee. In others, as in the maintenance of way department, the progress has been less rapid, even though there are many tasks that would appear to lend themselves to mechanical adaptation. One close student of this subject has arrived at the conclusion that the work of three-fourths of the employees in this department will some day be done either wholly or in part by mechanical means.

That the maintenance of way department has made

progress in this direction is apparent from a study of the articles published on the following pages. Particularly of interest are the figures presented by Mr. Neubert wherein it is shown that in spite of the marked increase in the amount of traffic which the tracks have been called upon to carry, the average number of man hours required for their maintenance per mile of track has decreased more than 10 per cent on the New York Central Lines East of Buffalo in the five years from 1920 to 1924, inclusive, as compared with the preceding five years.

The last few years have seen a marked increase in interest in labor-saving equipment on the part of railway men and on the part of those engaged in its design and manufacture. At the same time this development is in its infancy as far as the maintenance of way department is concerned. As this development proceeds the employees will be better paid because they will accomplish more and at the same time the cost to the railways will be reduced. It is in the promotion of this movement that the labor-saving number has become an annual feature of *Railway Engineering and Maintenance* which is being received with increasing interest by railway men and manufacturers alike from year to year.

#### THE PROBLEM OF MAINTENANCE

THE minute that a road begins to buy labor-saving equipment it faces the necessity for the maintenance of that equipment, for all machines require attention if they are to be operated with the maximum efficiency. This fact is often lost sight of or is ignored when such equipment is purchased, with the result that when repairs are necessary no provisions have been made for making them. Makeshift arrangements are then made hurriedly to send the equipment to the nearest mechanical department shop where it is turned over to men who know little or nothing about its construction and who are in no way responsible for the operation of the equipment when repaired, a condition which is, to say the least, not conducive to the best work.

An even greater objection to such a method of maintaining work equipment is the fact that it provides for no "stitch in time" maintenance and supervision. In many cases the costs that follow the interruption in the use of the equipment are greater than those which occur in the actual repair of the equipment itself, and the primary essential is to keep the machine working. This can not be done without periodic inspection to permit adjustment and replacement of parts before failure.

The arrangements for the maintenance of work equipment on most roads have "like Topsy, just grown" without systematic development and a study of the needs. The result is a cumbersome, expensive organization and, even more serious, a low standard of maintenance and an unnecessarily high percentage of delays.

The investment in the maintenance of way work equipment on the average road is larger today than is commonly realized. As an illustration, on the 3,500 miles of the New York Central lines east of Buffalo, there are approximately 2,000 units of work equipment, involving an investment of approximately \$3,750,000. Furthermore, this investment is growing daily. With an investment of this magnitude few roads can afford to neglect the development of organizations and the equipment of shops to keep this

equipment in condition for operation. Such a force will become skilled in the care of this specialized equipment and, being a part of the same organization that operates the equipment, will take the same interest in it and share the same responsibility for its efficient operation. Such an organization should also include field inspection and "first aid" service for much of the less rugged equipment such as motor cars, to postpone the necessity for sending them to the shops.

While such an organization may be attractive theoretically it is fair to inquire whether it will pay for itself. The best answer is a study of the results secured on those roads that have gone the farthest in this direction. Results in the maintenance of work equipment are evidenced in two ways. One is the percentage of time the equipment is in service or ready for service. With motor cars, for instance, on not a few roads not more than 85 per cent of the cars are in service at any time. On the other hand, it has been found possible on some roads with well-organized maintenance forces to keep as high as 95 per cent of the cars in service. This in itself is no small item for not only is the disorganization of 10 per cent of the force dependent upon this equipment eliminated but the road is receiving a return on 10 per cent more of its investment in this equipment.

The second factor is the out-of-pocket cost of maintenance. Here also it has been demonstrated that close supervision and a specialized organization can effect large economies through centralization in the work of repair, concentration and reduction in the stocks of repair parts, the more economical use of materials, through closer supervision, etc., etc. The magnitude of the savings possible through the concentration of supervision is shown by the results obtained on one road which reduced the cost of maintaining less than 2,000 motor cars \$50,000 in a single year.

The investment in work equipment on the average road is so large and is increasing so rapidly and the amount spent for its maintenance is so great that this subject warrants the careful consideration of officers of the maintenance of way department to insure that they are getting the maximum service possible from this equipment with the minimum expenditure for its up-keep.

#### A CLEAN MACHINE RARELY GIVES TROUBLE

IT IS the common observation of those in charge of work equipment that those units which are kept clean by their operators give much less trouble than those which are neglected. This is due to several reasons. In the first place, dirt itself is a deteriorating agency, getting into and cutting bearings and otherwise damaging the equipment. Furthermore, the accumulation of dirt and grease covers parts which may be failing from wear or other causes and prevents their detection prior to complete failure. On the other hand, the operator who keeps his equipment reasonably clean is not only able to discover such defects but in the act of removing the accumulation of dirt and grease actually discovers incipient failures of parts in time so that renewals can be made before complete failure and delay ensue.

In view of the evident advantages of neatness in the maintenance of equipment and its very direct relation to the cost of maintenance and dependability in service, this subject warrants more consideration

on the part of officers in charge of work equipment. In large measure results can be secured by the proper training of the operators, although in some cases disciplinary measures may be necessary. On at least one road whose standards of maintenance are high, continuous neglect of equipment is considered sufficient cause for the removal of the operator from service.

Work equipment represents a large investment on the progressive roads today. Its use results in large economies. For these reasons it is becoming increasingly important that it be maintained in condition to render the maximum return on the investment at all times. Neatness is an important factor in this standard of maintenance.

#### IS THE QUALITY OF LABOR IMPROVING?

**A**NY maintenance of way officer who has not forgotten the tribulations of the war period when efforts to obtain a sufficient force to keep the tracks in even a fair condition were carried to the extremity of the experimental employment of women, is not easily excited in these days by any "labor problem." To be sure there are labor problems today but they are minor as compared with the trials of the war years when "shipping out" was more often than not the means of beating the railroad out of a fare from one high-priced war industry job to another one. Those were the days of "model camps" when each road endeavored to provide meals, lodging and recreational facilities just a little better than those provided by an adjoining road. The marked advance made in the course of a few years in the feeding and housing of men has by no means been lost but practices in this regard have taken on a more conservative aspect because it is no longer necessary to offer unusual inducements to the class of men who seek employment in maintenance of way work.

The six years which have elapsed since the close of the war have seen some marked readjustments in labor of the kind employed on the track. The Italians, the Greeks and the old-fashioned hobos are becoming scarcer from year to year.

While there has been a marked reduction in the employment of men who could be classed definitely as foreigners in the sense that they were recent immigrants, natives of south eastern Europe are being employed on track work in considerable numbers, primarily in section gangs at or near large industrial centers.

The negro still plays an important part in track work although he has not proved as valuable in the north as in the south, a condition in which change of environment is probably the most important controlling factor.

The years since the war have seen the greatest change in regard to the Mexicans. Employed at one time only on the railroads in the southwest he is now to be found on roads over a large part of the United States. He has served to fill the gap where other classes of labor are not to be had, although lack of interest and initiative limit his usefulness.

The most marked change in the railway labor situation has resulted from the "easier" labor market, which has gradually reduced the turnover and decreased the drifting of men from one job to another. This has led to a considerable improvement in the efficiency of the men, an observation that is borne out by comments elsewhere in this issue.

#### Letters to the Editor

##### A SIMPLE METHOD OF STRING LINING CURVES

Rapid City, S. D.

To the Editor:

I have noted with interest the discussions in recent issues of *Railway Engineering and Maintenance* by J. R. Watt, general roadmaster, Louisville & Nashville, and Charles Weiss, assistant supervisor, Pennsylvania System, relative to different methods of string lining curves.

I believe this subject is worthy of further consideration by those concerned in maintaining good work.

The most successful of the methods that I have found and one that can be depended and used by all foremen is as follows:

(1) Establish the point of curve as nearly as possible, then mark stations 31 ft. apart and number them, using No. 1 for the point of curve and No. 0 for a station 31 ft. back from the point of curve (or station No. 1) on the tangent. (2) Use a 62-ft. cord and throw the even figured stations (every other station) as 2-4-6-8-10, etc., to the desired ordinate. Then start at either end of the curve and throw all odd figured stations to the proper ordinates (1 in. per degree of curvature), station No. 1 at the point of curve and the station at the point of tangent being lined to one-half the ordinates of the intermediate stations on a simple curve. After this has been done, spot out the odd stations (or stations last put to proper ordinates) by placing a small piece of dirt or gravel on the rail and line the track to these stations.

One application is generally sufficient for most curves and will improve the smoothness of line 50 per cent. If too badly out of line this process can be repeated. If the degree of curve is not known take the ordinates of all stations except station No. 1 and the station at the point of tangent, add them together and divide the total by the number of stations used (that is, if you add the ordinates at 20 stations, divide the total by 20), which will give the proper ordinate to be used.

This method has several features in its favor; (1) it requires no figuring on the part of the foremen, (2) it can be taught to and handled by any section foreman, (3) the throw is about the same out and in and the roadbed is not generally disturbed and the surface of the track spoiled, (4) a foreman cannot go wrong with this system and cannot help but improve the line, and (5) this method can be applied whenever the curve is surfaced, which will soon result in a true curve. A curve that is so badly out of line that it cannot be taken care of by this method needs a transit.

E. E. BARTON,  
Roadmaster, Chicago & North Western.



In a Mexican Labor Camp.

# All Indications Point to a Busy Year for 1926



Much Reconstruction Work Is in Progress

AT this season, when engineering and maintenance officers are preparing their program of work, it is essential that they have a reasonably accurate knowledge of the amount of work in prospect and the supply of labor available in the areas relatively remote from, as well as immediately adjacent to their lines. To meet the demand for this information *Railway Engineering and Maintenance* has made it a practice to communicate with railway officers in various parts of the country to ascertain the conditions in the area served by their lines and to present this information in its March or Labor Saving number. In accordance with this practice, we present below abstracts of statements given us by representative railway officers whose lines operate from the Atlantic to the Pacific and from the far north to the Mexican border. These reports follow:

## Labor Is More Efficient on the Lines of the Chesapeake and Ohio

By L. B. ALLEN

Superintendent Maintenance of Way, Chesapeake & Ohio, Richmond, Va.

A survey of the labor situation in the territory extending from the Atlantic seaboard at Newport News, Virginia, through Virginia, Southern West Virginia, Northern Kentucky, Southern Ohio and across Indiana, traversed by the Chesapeake and Ohio, shows that the labor supply during 1925 was plentiful. There is every indication that this condition will continue in 1926. Business conditions in the Southern West Virginia and Eastern Kentucky coal fields, due to an extra heavy production of soft coal, were generally very good. Road and other building was active. Railway maintenance programs were heavy and a fair amount of additions and betterments work, consisting of short stretches of double track and extensions of sidings and yards, was in progress. The indications are that approximately the same program will continue in 1926.

The volume of work does not appear to have depleted the labor supply to the extent of any noticeable shortage. There has at no time been any difficulty in securing sufficient native or nearby labor promptly to carry on the work. There has been little difference in the average individual efficiency of labor in the past two or three years. There is, however, a noticeable gain in the ability to select and retain the more effi-

cient laborers, due to the fact that the supply is ample, which permits the foreman to keep the men who work and get rid of the drones. This has resulted in a greater efficiency in the employed labor.

Labor saving equipment is being used to an increasing extent, both in variety and quality of devices used. This has undoubtedly had a material effect on the increase in labor supply and on labor efficiency.

Budgeting expenses and programming work have resulted in more uniform forces throughout the year. Steady employment for the regular force has done more to increase the efficiency of the regularly employed laborer than any other influence.

Time studies of performance and the keeping of unit costs of application of material have further increased efficiency. The necessity of performing railway maintenance work under very heavy traffic and the necessity of keeping the property maintained in a condition which permits the handling of heavy traffic without interruption has caused the maintenance officers to devise and effect the most efficient methods of doing work. The year 1925 showed a vast improvement in maintenance of way methods and results.

## A Marked Improvement in the Pittsburgh District

By F. R. LAYNG

Engineer of Track, Bessemer and Lake Erie, Greenville, Pa.

The year 1925, with respect to labor supply in this district, was exceptionally satisfactory. While there was, through most of the year, a sufficient supply of men available, there was at no time any considerable surplus. During the war period a large number of negroes from the South were imported into the Pittsburgh district and most of the manufacturing plants and railroads shipped in great numbers of the so-called hobo labor, establishing boarding camps within the mill plants and on railroad property. In 1925 most of the negroes disappeared from this district and the shipments of hobo labor were much reduced.

Practically none of the manufacturing plants now find it necessary to run their boarding camps, there being a sufficient supply of labor available that is provided with housing and boarding accommodations in the customary channels. Some large contractors and the railroads are still maintaining commissary camps, but the actual number of men shipped in from adja-

Reports from Various Parts of the Country Show Wide-Spread Activity and Indicate a Tighter Labor Situation

cent labor centers is very much reduced. During the early part of the year steel mill operations were slightly curtailed and the coal operators in much of the Pittsburgh territory had closed their mines. A considerable number of surplus men from these two industries found their way to the railroads and without doubt influenced the situation. During 1925 a very large amount of highway work was in progress in this district and in the City of Pittsburgh proper, there was an unusual amount of public work in progress. The building trades were also making unusual demands on the labor supply. Toward the end of the year the steel mill operations were increased so that one prominent commissary man, shipping from New York, Chicago and Buffalo, supplying a trunk Line, was unable to increase his floating gangs to the extent desired. As far as section labor was concerned there was absolutely no shortage. There seems to be an ample supply of men who are willing to work in the regular section gangs, a large percentage of whom are natives living adjacent to the railroads. The widespread use of the automobile has increased the territory from which such labor can be drawn and it is not unusual to have men drive from 10 to 15 miles to reach the headquarters of the gang.

The year 1926 promises to be a busy one for the railroads in this district. Large terminal improvements are under way, and more than the usual amount of maintenance work will be done this year. One of the steel companies has announced a large program of extension and improvement of its present facilities. The prospect for highway work and the building trades points to appreciable slowing down in these activities.

At present there is a lull in the steel business, but there is every prospect that their operations will be very materially increased. The future in the coal industry is rather less clear, but it seems probable that their operations will still be very much curtailed during most of the year 1926. This is especially true since the anthracite strike has been settled. On the whole it seems quite clear that there will be no serious shortage of labor in the Pittsburgh district during 1926 and yet if the steel business increases its activity and the coal operators resume, there will no doubt be some shortage.

The general testimony of railroads, contractors and manufacturing plants is that the efficiency of labor was materially raised during the last few years. It is a conservative statement to say that this increase will average at least 25 per cent and in many instances it runs considerably more. This is no doubt accounted for in part by the fact that there has been no actual shortage and the competition between the various companies for labor has been practically eliminated. Another factor has been the introduction of labor saving equipment. Contractors and manufacturing plants have increased the use of machinery to a greater extent than the railroads, and this is not only reducing the actual number of men required but it is our observation that it has increased the enthusiasm and efficiency of those that are employed. Of course the railroads have made marked progress in the use of labor saving devices, one of the most useful additions to the railroad work being the locomotive crane, which is being used to a much greater extent than ever before. The introduction of motor cars, ballast spreaders, ditchers and better tools is also having its effect on railway labor requirements.

We believe that we can look forward to 1926, confident that a large amount of maintenance and construc-

tion work will be carried out by the roads in this district and that we can reasonably expect sufficient labor to complete this year's program without resorting to any unusual means to secure and hold men.

## Maintenance Will Be Above Normal in Michigan

By J. F. DEIMLING

Chief Engineer, Michigan Central, Detroit, Mich.

Our supply of maintenance of way labor was adequate during the whole of 1925, although we had anticipated a scarcity. It is expected that maintenance of way work and other activities in this district will be somewhat above normal during 1926. The indications are that the supply of maintenance of way labor will be somewhat less plentiful this year than last.

Efficiency of temporary labor varies with the supply and demand. When labor is scarce, efficiency drops; when plentiful, it increases. The efficiency of the permanent maintenance of way force is nearer constant than it has been.

The increasing use of labor-saving equipment is beneficial to maintenance of way, as to other labor fields. It increases the supply by minimizing the demand. The increase in supply improves the quality of labor obtainable. It is hardly possible to express the extent definitely because it affects the entire labor market.

## Much Work in Prospect in Southwest

By H. M. LULL

Chief Engineer, Southern Pacific Lines, Houston, Texas

During 1925 there was an ample supply of track labor (principally Mexicans in Texas and Negroes in Louisiana) on these lines, except during the last three or four months of the year when the demand for labor in the harvest fields and in other parts of the South and West created a temporary shortage in some localities. The supply of labor in the bridge and building department and for other skilled work was sufficient to meet requirements throughout the year.

The amount of railway and other work in prospect in Texas this year appears to be in excess of the average for the past few years. Extensions are contemplated or are in progress, on several railroads in this territory and other improvements will be at least normal. Should traffic and revenues be sufficient throughout the year to justify the continuance of additions and improvement work to the extent indicated above, there will no doubt be some shortage of labor, especially during the harvest season. In some parts of this territory the shortage will probably be of greater extent than during other recent years.

So far as I can see there has not been any material increase in the efficiency of labor during the past two or three years. There was a material increase in efficiency for a year or two after the roads were returned to their owners in 1920.

Labor saving equipment is taking the place of hand labor to a small extent on our lines and on other roads in this vicinity. The use of motor cars, ditching machines, rail layers, track liners and similar facilities makes it possible to accomplish work during times of labor shortage which would otherwise be impracticable to undertake, these machines also increase efficiency and raise the standard of maintenance. The use of improved track appliances, such as rail anchors, heat-treated angle bars and bolts, improved spring

washers, etc., also tends to decrease the amount of labor required for track maintenance; the labor required for tie renewals is also decreasing on account of improved treatment and longer life of ties. On the other hand, heavier axle loads and increased traffic creates greater damage to track and roadbed and on this account the labor requirement per mile of line remains nearly constant.

## Labor Shortage Expected in Southwest

By F. G. JONAH

Chief Engineer, St. Louis-San Francisco, St. Louis, Mo.

I think that we can reasonably anticipate a scarcity of labor in the territory through which we operate due to the fact that our section of country is experiencing very prosperous conditions. There is an unusual amount of building going on in the cities and with the good roads programs of the various states and considerable improvement work on the railways themselves, it is certain that labor is going to be generally well employed. There is comparatively little unemployment in this section of the country at the present time.

The scarcity of labor becomes acute in certain sections during the cotton picking season. Whether it will be embarrassing this year depends to a great extent upon the crop conditions. The Frisco operates through several large cotton producing states. In 1925 we raised more cotton in several of our southern states than in any year since the boll weevil first made its appearance in the United States, and for a time our colored labor abandoned all other kinds of work for the picking of cotton due to the high wages they were able to make while gathering the crop. In certain sections of Mississippi this condition was relieved by the bringing in for the first time of Mexican labor. Our southwest labor situation will be relieved by the movement north of Mexican labor from the border.

There is no doubt but that there has been a gradual improvement in the efficiency of labor since the close of the war. It is noticeably better each year. Labor-saving devices and equipment offer the only method to keep the high cost of production down in any field, due to the increasing price of labor and material.

## It Will Be an Active Year in the Central States

By HADLEY BALDWIN

Chief Engineer, Cleveland, Cincinnati, Chicago & St. Louis,  
Cincinnati, Ohio

The labor supply during 1925 was adequate for our requirements. The amount of railway and other work in prospect on our line this year is somewhat greater than last year. We have about 26 miles of double track grade reduction work in progress in our Cincinnati-Sandusky division between Springfield and Bellefontaine, Ohio, and about 7 miles of similar work on our Cleveland-Indianapolis division, just west of Bellefontaine. We expect to have a good deal of work in the way of enlarging freight terminal facilities at Cincinnati this year, which will be apart from the Cincinnati joint terminal project. It is within the range of possibility that we will have some additional double track grade reduction work authorized on other parts of the system during the year.

The effect of this volume of work on the supply of labor will be to tend to increase demand, although all of the work in question will be handled by contractors who may get their forces largely from outside labor centers.

The work of company forces will be limited to track construction. Without having statistics, I would say that we do not anticipate that the work we have in mind this year will be embarrassed by any shortage of working forces.

For various reasons I believe that the efficiency of labor has improved during the past year as compared with the previous year, but probably not very much.

While we have extended our use of labor saving equipment, such as rail laying machines and tie tamping machines, apart from taking advantage of various minor devices for increasing the efficiency of track labor, I cannot say that we have gone into any new labor-saving devices as compared with last year.

## Good Crops Indicate Labor Shortage in South

By L. H. BOND

Engineer Maintenance of Way, Illinois Central, Chicago

Our company intends to do only the ordinary amount of work during the present season. It is rather difficult to say just what the labor situation will be, but if the last few months in 1925 will serve as a guide, it would appear that there will be more or less of a labor shortage in several localities. I am inclined to believe that other railroads will do more work than last year, which will perhaps take any surplus labor that was available in 1925.

The efficiency of the labor seems to be entirely dependent upon the supply. If the supply is good, the labor is rather efficient, and if the supply is poor, the efficiency decreases almost in direct proportion.

The labor supply in 1925 was plentiful until about August 15. In the South the demand for cotton pickers absorbed all of the idle labor and caused quite a shortage that continued through the remainder of the year. Labor saving devices have solved the problem of labor shortage to some extent but not sufficiently to reduce requirements more than four or five per cent.

## Efficiency Increased in Central West

By C. A. MORSE

Chief Engineer, Chicago, Rock Island and Pacific, Chicago

We had an adequate supply of labor during 1925 for our maintenance of way work, with the exception of a month or six weeks in June and July while the wheat harvest was in progress, but a shortage at this period is a regular thing with us each year and we try to plan our work with the expectation that we will be short of labor on those portions of our lines where large areas are devoted to wheat raising.

It looks at this time as though 1926 would see about the same amount of railway and other improvement work as 1925. There may, however, be some diminution in the building program being carried on in the various states. I do not look for any shortage of labor due to general improvement work in our vicinity during 1926.

It is the general opinion of our roadmasters and division engineers that the efficiency of labor has increased very materially during the past two or three years. The introduction of labor-saving equipment has very materially reduced the requirements for labor in connection with maintenance work on our railroad. The use of the spreader ditcher, the track liner, electric and pneumatic tie tamping machines, the practically 100 per cent installation that we now have of tieplates and the benefits that we have derived from what is now practically 100 per cent creosoted track ties, the use of trackmower and

disc weed-cutting machines, have made it possible to maintain main line sections with from three to four men to the section as compared with five to six men previously. Also, in relaying rail, the use of rail-laying machines has reduced very materially the number of men required for that class of work, while in ballasting, the use of the center dump ballast car has eliminated a large amount of labor required to shovel ballast into the center of the track. Taking the labor saving devices enumerated above, together with various others that might be mentioned, I think it is safe to say that the track labor required per mile in maintenance today, is not over two-thirds of what it was ten years ago.

## Mechanical Equipment Increases Efficiency

By R. B. ROBINSON

Engineer Maintenance of Way, Union Pacific, Omaha, Neb.

Mechanical equipment is being used wherever the ends of safety and efficiency are gained, particularly in heavy lifting operations. The labor situation will probably be easy up to May 1, and then tight for the balance of the year. Indications point toward at least as much industrial development in Union Pacific territory in 1926 as in 1925, and this will call for some industrial track construction but no large railroad building jobs that I know of.

There is also considerable city and highway work planned, and fair falls of snow back on the watersheds to supply water for the irrigated territories, which in turn points toward fair crops with also fair grass on the ranges. In view of all of these conditions, I feel that the year 1926 is starting out to be a good steady year for all lines of industry, without reason for any booms or thrills and with fair assurance that there will be jobs for all real workers.

We find that along with more consistent wage scales and the use of mechanical equipment, we are experiencing a very gratifying increase in man-hour efficiency and production, in which the slacker or plodder finds that he is being pushed aside by the honest, intelligent, energetic worker.

## Labor Supply Adequate in Northwest

By Engineer Maintenance of Way, Northwestern Road

The labor supply was satisfactory during the year 1925. Maintenance of way work was started as early as the weather would permit. There is considerable advantage in doing this as the men work better in the cool spring months, and later in the season when the demand for harvest hands is felt the work is far enough along that reductions can be made.

From present indications there will be a normal amount of maintenance work this year with a slight increase in construction and new work. It appears that the amount of outside work, such as county and state road constructions, and the labor required by outside industries will be greater this year than during 1925, and as there were few idle men throughout our territory last year, it would seem the labor supply would not be quite as favorable this year, and a larger number of men will have to be supplied from the eastern centers.

We have found there has been a gradual increase in the efficiency of labor the past four years. The men are more content with working conditions and the

labor turnover is the lowest it has been in many years. This is partly due to our practice of employing more men locally for section and extra gangs. Every effort is made to recruit all of the men possible from the towns along our line. From this class of labor we secure better service than from labor shipped in for seasonal work. The use of labor saving devices in maintenance of way work has also helped to increase the efficiency of labor.

Some of the labor saving devices may not show a great saving in money, but it has been observed that they tend to speed up the work and set a pace which the men try to follow. An experiment was tried last year on a secondary line. Instructions were issued to cut no weeds by hand on this district, which was 120 miles in length. Weeds within the limits of the ties were burned, the ballast shoulder weeds were cut with a type of disc machine and the subgrade was cut with a track mower. With the same labor allowance as former years, there was a marked improvement in the condition of the track at the close of the season, due to the fact that all the labor allowed was used in work which improved track conditions. This practice will be extended this year to other lines where these devices can be used to advantage.

## Large Construction Program Under Way

By W. H. KIRKBRIDE

Engineer of Maintenance of Way and Structures, Southern Pacific, San Francisco, Calif.

Labor in the vicinity of our lines was plentiful during 1925. A large amount of new construction is now under way on this railroad and there is every indication of a very busy year, especially in the building trades. With the rainfall now nearly normal, the outlook for good crops is very promising. However, we do not anticipate any appreciable shortage of labor except possibly of common labor during the seasonal fruit season.

I believe the efficiency of labor has materially increased during the last few years and that the men as a whole are better contented and do not change around as frequently as in the past.

## Other Roads Report Awards

**S**UPPLEMENTING the reports of the award of prizes and the results of annual track inspections which were presented in the December and January issues of *Railway Engineering and Maintenance*, we present below the summary of the results on the Delaware, Lackawanna & Western and the New York Central lines east of Buffalo.

### Lackawanna Awards Prizes

The award of prizes on the Lackawanna is made entirely to section foremen. The first and second prizes are given for the highest and second highest rating on each supervisor's district. The first prize embraces a purse of \$100 and a silver medal, together with a section marker sign. The second prize covers an award of \$50 and a second prize medal. Any section foreman who wins the first prize for three consecutive years receives a \$10 per month addition to his salary during the following year and continuing thereafter so long as his section is maintained to the same efficiency, his section being designated as an "efficiency" section. The awards on

the various supervisor's districts, including the names of the first and second prize winners and the names of the efficiency foremen are as follows:

Morris and Essex division, east end: First prize, J. Worzel, Denville, N. J.; second prize, A. Gordon, Boonton, N. J.; efficiency, J. Venezio, Secaucus, N. J.

Morris and Essex division, west end: First prize, M. Tozzi, Johnsonburg, N. J.; second prize, L. DiSantis, Hackettstown, N. J.; efficiency, P. Tozzi, Portland, Pa.; Eugene Morgan, Blairstown, N. J.; and Joseph Morgan, Johnsonburg, N. J.

Scranton division, east end: First prize, T. Grady, Tobyhanna, Pa.; second prize, J. Wilcox, Slateford Junction, Pa.; efficiency, W. Sutton, Mt. Pocono, Pa., and J. Kocella, Pocono Summit, Pa.

Scranton division, west end: First prize, Fred Brown, Foster, Pa.; second prize, M. J. Fernan, New Milford, Pa.; efficiency, J. Fernan, New Milford, Pa., and A. Scott, Kingsley, Pa.

Buffalo division, east end: First prize, A. Gliserene, Bath, N. Y.; second prize, A. Ciserene, Horse Heads, N. Y.; efficiency, J. Green Savona, N. Y.; T. Carey, Painted Post, N. Y.; and J. Romeo, Apalachin, N. Y.

Buffalo division, west end: First prize, C. Velocci, Lancaster, N. Y.; second prize, J. Hart, B. R. & P. Junction, N. Y.; efficiency, J. C. Keating, Wallace, N. Y., and J. Morgan, Avoca, N. Y.

Bloomsburg division: First prize, T. Shingler, Berwick, Pa.; second prize, F. Pignono, Wyoming, Pa.; efficiency, R. Shingler, Espy, Pa.; D. Blizzard, Danville, Pa.; G. Thomas, Shickshinny, Pa., and L. Miller, Northumberland, Pa.

Syracuse division: First prize, A. Spezzale, Tully, N. Y., and second prize, L. Warner, Chenango Forks, N. Y.

Utica division: First prize, F. Julian, Waterville, N. Y.; second prize, J. Biviano, Norwich, N. Y.; efficiency, John Moran, Waterville, N. Y., and W. Locantro, Sherburne, N. Y.

#### New York Central Awards Increases of Salary to Prize-Winning Foremen

For the purpose of affording all foremen an equal opportunity in working for premiums, all of the sections on the lines of the New York Central, Buffalo and east, have been placed in six different groups, or classifications to the end that all sections grouped under a single classification are substantially on a parity as to physical conditions, standards of maintenance, etc. These groups include the electric division and classifications No. 1 to 5. First premiums are awarded to the foremen whose sections receive the highest rating on each supervisor's subdivision and in addition a so-called classification prize is awarded to the foreman whose section receives the highest marking in the entire classification. The subdivision prize takes the form of an increase in salary of \$5 per month throughout the year following that in which the prize was won. The foreman receiving the highest mark in east classification or the classification prize in classifications 1, 2, 3, and 5, receives an additional premium of \$3 per month and in classification 4, an additional premium of \$2 per month. The winners of the five classification prizes on this road for the year 1925 are as follows:

Classification 1, John Andros, subdivision 3, Eastern division; Classification 2, Emanuel Teats, subdivision 27, Pennsylvania division; Classification 3, Charles W. Downs, subdivision 9, Adirondack division; Classification 4, Joseph Chubell, subdivision 13-A, Buffalo division; Classification 5, Joseph Crzybeck, subdivision 13, Buffalo division.

A comparison of the ratings by supervisor's subdivisions showed that subdivision 10 on the Syracuse division, in charge of W. M. Skelton, received the highest rating, 85.1; that subdivision 13-B, Buffalo division, in charge of J. P. Sexton, received the second highest rating, 84.9, and that subdivision 13 of the Buffalo division, in charge of T. J. Sexton, received the third highest rating, 84.1. On the basis of divisions the highest rating was received by the Buffalo division, with an average of 84.4.

## Respect a Treated Tie

UNDER the above caption H. B. Hoyt, superintendent of the B. R. & P. timber preserving plant at Bradford, Pa., has addressed a letter to each track foreman on that road, telling him the various reasons why a tie is treated and pointing out the reasons why it is to his interest to protect it. The letter is so generally applicable to other roads that it is reprinted here in part, as follows:

Wood decays because it is attacked by a fungus plant. There are many kinds of fungus plants; some live and grow on some kinds of soil or food and some on others. The fungus plants we are perhaps most familiar with are the toad stool, mushroom, puff ball or the fan-shaped growth often seen on partly rotted tree trunks or logs.

The fungus plants start originally from seed. The seeds or "spores," as fungus seeds are called, are the smallest seeds known. If you have ever stepped on a dry puff ball, you have noticed the brown dust that came from it. That dust is nothing but seeds, each so small that millions are set free when you step on a puff ball. Each seed is eager to get to a place where it can start to grow.

We treat our track ties with creosote or zinc chloride so that when a fungus seed or "spore" lights on the tie it will not grow. We poison the wood against the fungus plant. If the fungus can't grow, the tie cannot rot. But our ties are not treated all through. It is impossible to do this with most woods. Most of them are untreated in the inside. There is only a sort of a treated shell around an untreated interior. But if a fungus can't get through the treated shell to the interior, the untreated interior as well as the treated shell will not rot and the whole tie will remain sound. But suppose a pick is driven into the tie way through the treated shell into the untreated interior. This at once makes an opening or a "garden spot" for a fungus seed. This is true also when a corner is knocked off or when a derailed wheel cuts into the untreated interior of a tie. This is why you adze and then paint with creosote your damaged or "wounded" ties, so the fungus can't get a start at the "wounds" which have exposed the untreated wood.

Treating ties will not make a bad tie good, but will keep a good tie good, if it is taken care of afterwards. The ties are then sent to the timber preserving plant and piled in standard open piles to season. Any ties that show signs of cracking or checking on the ends are held together by check irons. Then as soon as the ties are piled the ends are painted with hot creosote because these ends are where the fungus seeds start to grow easiest and we want to keep our ties as free from fungus as possible before we treat them.

The amount of creosote used in each tie, the proper pressure, and temperature and seasoning are watched by experienced men and finally the proper handling and loading so that the tie as it comes to you is as good a treated tie as we know how to prepare. The timber nails and the dating nails are put in for service records so that we can be sure we are using the right kind of wood and the right kind of treatment, by watching the service the ties of the various kinds are giving. The cards you fill out when you install or remove treated ties are the basis of the records and you should be accurate in making them out. We are anxious to know just why any treated ties come out of track.

A treated tie is one of your best friends. Treat it as one. It will stand by you for many years and the better you take care of it, the longer it will help you.



*The Maintenance Department Still Employs the Largest Proportion of Labor Forces*

## Can We Expect a Decline In Our Labor Requirements?

**Some Reasons Why the Demands for Labor Have Not Kept Pace with the Increase in Transportation Produced**

By J. V. NEUBERT  
Engineer Maintenance of Way, New York Central

IN REVIEWING the transportation problems that have confronted railroads in the United States during the last ten years, or from a time just prior to our entry into the war through the period of federal control and the years since that time, and considering the fluctuations in money values during that period, one wonders how the upkeep of the railroad properties has been possible, and particularly how some of them have been able to exist. The total mileage of all railroads in the United States has decreased over 5,000 miles during the last 10 years. The gross ton miles have increased from 18 to 20 per cent during the same period, while the freight car loadings have increased 20 to 40 per cent, and the tractive effort of motive power approximately 20 per cent. With these changes of transportation one would expect a proportionate increase in the expenditures for the maintenance of way and structures of a railroad or an increase in man power or man hours to meet the demand of this growth in traffic on the upkeep of the property.

I believe the end of the year 1925 left the roadway in general in this country in as good, if not a better physical condition than at any time within the last ten years, or during the time of the growth of transportation mentioned above. At the same time, if one makes the proper analysis of the man-hours applied for all classes of maintenance of way and structures work for an average of the last three years as compared with the average of three years prior to that period, he will find that the average number of man-hours service in

maintenance of way expenses is at least five per cent less. In support of this statement I find that the number of man-hours applied per year per mile of track for all classes of maintenance work on the New York Central Lines east of Buffalo, was as follows:

Year	Man-Hours Per Month
1915.....	282
1916.....	290
1917.....	290
1918.....	250
1919.....	245
1920.....	260
1921.....	190
1922.....	225
1923.....	290
1924.....	240

An average of about 65 per cent of the maintenance of way department's total forces are classified as "laborers." With the fluctuating supply and demand of such forces, the varying conditions of the property and its upkeep have to be met, and a number of the railroads have also had to spend large sums of money for special conditions.

### Some of the Ways in Which Labor Has Been Saved

Drainage was not given very much consideration a number of years ago, and such of it as was done was done entirely by hand labor. Today our heavy cuts are taken care of by machine ditchers with work trains, the material being loaded on dump cars and deposited on adjoining fills. Besides this, air-operated spreaders

with ditcher wings take care of the smaller cuts and level the material down as it is deposited on the fills. Both types of equipment are operated with train crews and with very few men while they can be worked during unfavorable weather, whereas in the old days the men refused to work in unfavorable weather and in wet cuts. Modern equipment has improved the drainage of the cuts as well as reinforced the fills at the same time, and has reduced by more than one-half the man-hours formerly applied.

The average life of an untreated cross tie is estimated at between 10 and 11 years for all service. With the introduction of treated ties the life has been increased easily to 20 years, or about 100 per cent. To offset this in recent years we are using more ties per mile on account of the increased traffic. However, taking all phases into consideration, we should secure 60 if not 75 per cent greater performance from our ties and every less tie applied represents one man-hour per year saved because it takes an average of one hour's service to remove an old tie and properly install a new one.

The introduction and the larger use of shoulder tie plates of heavier and larger sizes has also been a big aid. It was formerly the common practice during the late fall, winter and early spring to follow up very closely on the various track sections to see what proportion of their tracks had been corrected or regaged during that period to reduce that work to a minimum during the summer working season. The modern tie plates have reduced the mechanical destruction of the tie materially and helped to prolong its life, while at the same time affording a stronger and stiffer track structure for the traffic imposed upon it.

The larger use of open hearth rail has reduced materially the percentage of broken and defective rails requiring immediate removal, such as split heads, pipes, flange breaks, etc. Besides the introduction of heavier rails has given a much firmer track structure and introduced a greater factor of safety for that structure throughout all climatic conditions, which are reflected in a greater ton mile life.

With the improved drainage conditions and strengthening of the sub-structure, better ballast is being used more generally until today the ballast most commonly employed for main track service is washed gravel, crushed hard slag and crushed stone. They afford a more permanent and maintain a smoother roadbed, especially the latter two materials, as they can be worked from one to three months per year longer; they also afford better drainage and maintain a smoother surface and better alignment; furthermore, they have a longer life. If the general surface of the track gets run down and the ballast becomes foul, it imposes a hardship on the entire track structure.

The use of anti-creepers to prevent the rail from creeping also keeps the cross ties in the proper location and position, avoids a certain amount of resurfacing, regaging and respacing of ties and where excessive creeping is existing, or did exist, it destroys the general surface and alignment and imposes an undue hardship on all the material of the track structure.

The introduction of motor cars in place of hand cars for transporting section and other employes to and from their work has saved from 15 to 30 min. per man per day, and has helped materially in maintaining a more constant force in certain localities. The foreman and their men are more willing to do a good day's work when they know that they do not have to pump a hand car several miles against the wind after the day's toil. A motor car also permits one to collect forces more

quickly during unusual and emergency conditions, which means service.

The pneumatic tie tamper for tamping ties has been a great help where traffic is heavy, especially in crushed slag and crushed stone ballast. It possibly does not save any man-hours in application, but it puts a refinement in the track by reason of insuring that every individual tie is thoroughly and uniformly tamped, which result cannot be secured from the present track labor, and it maintains this refinement of surface and alignment for a longer period.

The track pile driver has long been used for driving piles but in checking up the use of those pile drivers in permanent bridge and building construction work and similar service, it has been found that they have given way in large measure to the locomotive crane equipped with pile driver leads and a steam hammer to drive piles straight or battered, and within a reasonable radius from the tracks, and also with clam shell and orange peel buckets for the loading and unloading of materials and the handling of excavation work, as well as with a generator and magnet for the handling of miscellaneous scrap, etc. As they are self-propelling, these cranes can handle materials and in many cases perform much bridge and building work in terminals without the use of a work train. They can also be used for bridge erection, within the limit of capacity of the crane. In brief, they are an every-day machine. The best way to determine their importance is to try to take one away from a supervisor who is familiar with its general use. Work train derrick cars for handling rails, frogs and other track materials have been of great help in reducing the number of men ordinarily carried in a work train gang, and at the same time in reducing the liability of accident in handling and distributing such materials.

The mechanical air dump cars have been of great assistance in steam shovel, ditcher and similar work for the output can easily be increased 100 per cent greater with less cars than with flat car equipment. These cars can also be used for handling miscellaneous materials and rip rap for reinforcing the roadbed and can be unloaded quickly with practically no interruption to traffic. In the winter time they can be assigned to the handling of cinders or similar materials at engine terminals.

The air-operated spreader cars are used in the summer season for ditching, spreading materials on shoulders or fills, construction work with steam shovels and other miscellaneous work, while in the winter they can be assigned to the handling of snow, as they are also equipped with flanger and ice-cutting attachments. When they are in service they will easily do the work of 100 men, and in snow storms it is hard to estimate the value of their quick relief in cleaning yards and removing ice.

We have ballast cars which distribute the ballast uniformly in accordance with the requirements, eliminating man-power for unloading it and distributing it uniformly along the right-of-way which would otherwise require extra labor for its proper application. In the winter time these cars can be assigned to coal or similar service.

Weeding cars of standard gage, operated by air, have also been devised for digging up roots and weeds, and also shaking of the roadbed where the ballast becomes foul. These machines aid materially in correcting weak conditions and also help in respect to the tie renewals and general track work.

Oil is applied to track fastenings by means of cars which distribute the proper oil at the correct temperature over the web and base of the rail and the splice bars, spikes and tie plates, to prevent them from corroding, which adds to their life at a comparatively small expense.

A number of railroads have to maintain a vast amount of snow equipment, such as snow sweepers, rotary snow plows, push plows and flangers. Sometimes it is a question whether a railroad is over or under-supplied with such equipment, as the severe storms are irregular and many times beyond control, but this equipment must be held in reserve for the protection of property in the same way that a fire department protects a city. Without this protection a railroad's continuity of operation would be jeopardized many times.

We have made great progress in the development of materials and equipment during the last five or more years. However, one must be careful not to over-equip with such supplies. It is easy to estimate a large saving from an individual purchase, but one must base this estimate on the performance for such material or equipment for a year or more. He should take into consideration the first cost, depreciation and interest on the investment in order to arrive at the proper saving, as material and equipment often have short life and a

great depreciation when standing idle and not in service.

In spite of this word of caution, I feel that if the various railroads do not consider the improved equipment that will help and relieve them in keeping the man-hours down in proportion to the increasing ton miles of traffic, they will have to increase their man-hours service considerably and with the increased rates of pay the cost of this labor will affect their operating ratio materially. This is not only true in the maintenance of way department, but in all departments in the transportation field.

The improved devices have helped keep the increase in man-hours of service within that of transportation output. At the end of the year 1925 we have a closer relation between officers and the rank and file and a greater realization that we are all human beings working to serve, and thinking more than ever how every individual man-hours service can be distributed and applied to the best advantage to improve the upkeep of the property and the service to the public.

## How We Are Cutting Our Maintenance of Way & Structures Payroll \$50,000,000 a Year



*The Pyramids Were Built Before the Days of Labor Saving*

THE PYRAMIDS of Egypt still remain a wonder of the world. Rapidly, they are becoming the wonder of the world. To the youth of a day not so long past, the description of their construction was a source of amazement; to present day youth it is a source of amusement.

History and romance have storied them; the comic strip and the cinematograph caricature them. Toiling humans teamed by hundreds straining at ropes dragging huge stones along a causeway of monstrous conception inspire nothing but amusing contempt in the mind of the youth of today. More power available in a day by the pressing of a button than was concentrated by a Pharaoh in a decade, leaves naught for wonder except the stupidity that demanded such effort for such futile accomplishment.

Reflection upon the progress in human development that has taken place since that far-off period is the inspiration for the action which demands the substitution of material and machine for the last ounce of power of unskilled labor.

Deductive political economists see in it the emancipation of the peoples of the world and that progress which is the due of beings with intellect endowed by the Creator. Modern business sees the opportunity for most complete economy in the operation of the property with which it is entrusted, and the fulfill-

ment of the obligation involved in the stewardship it has assumed.

Are the railroads of America contributing their share in the advance? And, more particularly, is that department of the roads—the maintenance of way and structures—which by the nature of its work always has employed the major proportion of unskilled workers, substituting materials and machines in accordance with the obligation implied by such employment?

### The Conservation of Ties

The largest single item of expense for materials in maintenance of way accounts is ties. Less than three decades ago the use of untreated timbers was almost universal. So rapid has been the reversal of this practice that today more than half of all the cross ties used are treated; the time is not far distant when the use of any untreated timber for ties will be unknown.

What are the facts? An average untreated tie of the most durable wood will last nine years in track and cost \$0.22 per year; less durable woods treated will give double that life and cost \$0.19 per year in track.

Apply that saving of three cents per tie per year to roads with the following situations and note the results when all ties in track are treated:

Territory	Ties in Track	Saving per year
A road with 5,000 miles of tracks.....	13,300,000	\$ 400,000
A road with 12,500 miles of tracks.....	33,300,000	1,000,000
All Class I roads, 280,000 miles of tracks .....	780,000,000	23,400,000

The rapid adoption of treated ties by railroads assures the realization of this situation. Not the least

of this saving is that which accrues from the elimination of one complete operation of renewal brought about by the doubling of the life of the material through treatment, and the release of large forces of workers for other necessary operations.

#### Adzing and Boring Ties

In addition to the preservation afforded by treatment, there is a conservation of timber given by the preliminary framing prior to treatment so as to provide for a uniform bearing of rail, thorough penetration of preservative in the critical zone beneath the rail, and avoidance of destruction of wood fibre by the driven spike. Adzing and boring by machine have accomplished those ends and have provided a means for counteracting the ever-increasing encroachment upon the service life of ties resulting from increased traffic and axle load. It is conservatively estimated that at least one year's additional life is thus given the tie. Translated into annual savings it means approximately one-third of a cent per tie per year for every tie in track thus prepared.

There is a progressive increase in the number of mills of that character being constructed. The evidence of the savings they effect and the other advantages that accrue forecast their general establishment. The saving of one-third cent per tie per year from a one year's extension of life becomes approximately one cent per tie when the life is extended two years. Applied to the 780,000,000 ties in track susceptible of such preparation, the saving becomes in the first instance \$2,600,000 per year, and in the second instance \$7,800,000 per year. Again, no inconsiderable element is the postponement of the period when the labor for renewal is required.

#### Mechanical Tie Tampers

The one item in maintenance of way and structures which requires greatest expenditure for labor is track lining and surfacing. Approximately one-third of all track labor is engaged upon this work, and of this, a large percentage is employed in the simple, monotonous task of tamping ties.

Principal among the devices in use as substitutes for the labor of surfacing track are the pneumatic and the electric tie tampers. These are in service on a large number of the lines of the principal carriers, generally in territory of hard ballast. The economies which they have effected are forcing a progressive extension of their use and warrant the assumption that in a not distant future they, or machines of improved designs, will be in general use in all hard ballast territory.

Various results in the savings which they effect are shown by investigations. In some cases there is reported no actual reduction in the cost of surfacing by these machines when the annual charges for repairs, interest and depreciation on the equipment are included; others report a reduction, while a few show an increase. It is conceded by practically all who have used these machines that there is an increase in the amount of work done per man, and a uniformity and permanency of track surface much superior to that given by pick tamping.

A summary of the data available indicates that the increased output by machine tamping is approximately 35 per cent, and that track thus surfaced will last about 50 per cent longer. Translated into savings in labor, and applied to 1,000 miles of track surfaced per year, the actual labor required at time track is surfaced would be:

Pick tamping.....	342 men per year
Machine tamping 35 per cent less.....	222 men per year

Saving .....	120 men per year
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Accepting one year as the average period that track tamped with picks will remain in surface and extending so as to cover an equal cycle of years that track is kept in service by both methods and reducing to an annual basis, this becomes:

Pick tamping.....	342 men per year
Machine tamping.....	148 men per year

Saving .....	194 men per year
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Upon 50,000 miles of track in the country which may be found in hard ballast territory, therefore, a conservation of 50 times 194 or nearly 10,000 men has been and can be made and they relieved of the laborious work of tamping by hand.

#### Devices for Surfacing in Soft Ballast

The problem of keeping tracks in soft ballast in good line and surface becomes largely one of distribution and placement of the material available. Soft ballast is not adequate for service in main tracks of dense traffic on our leading trunk lines. It does serve amply on tracks of lighter traffic and may be distributed, placed and used for surfacing at much less expense than hard ballast.

When renewal is required it is necessary to remove the old ballast entirely; cleaning is not practical. Usually the removal is accomplished simply by cribbing out as much as can be reached by shovels and by raising track sufficiently to use the old ballast as roadbed, replenishing with new material.

Cribbing is still being done largely by hand, although a beginning has been made in the use of machines designed to supersede that method. In multiple track territory mechanical loaders are used to dispose of the cribbed material. Specially designed ballast cars are marketed for the purpose of controlling the release of new ballast material so that the labor of re-handling to place is reduced to a minimum.

Where such cars are not available, the ingenuity of supervisors has provided adjustable chain and brace appliances for controlling the unloading from revenue equipment. In one case at least a notable improvement on that equipment was provided locally by the designing of a trough for suspension beneath the pockets of hopper cars. By means of an adjustable plate at each end of the bottom of the trough, the flow of ballast from the car is varied or stopped entirely as required during the time the train is in movement over the territory being reballasted. In that manner, the labor usually required to re-handling for uniform distribution is eliminated.

#### Track Liners

Incident to surfacing track comes the need for adjustment of line. Until within recent years the lining bar had been in general use in both hard and soft ballast track. Practical track men, realizing the possibility of increased power and facility by the use of a mechanical lever device similar to that used in "pinching" cars, have been responsible within the past few years, for the development of nearly a hundred patented devices of that character for lining track.

The labor involved in lining track is but a small proportion of the whole operation of lining and surfacing, requiring only five or six per cent of the time of that whole operation. Generally, however, it is a task requiring strenuous effort on the part of men assigned to do the work with lining bars, and fre-

quently necessitates the combination of section gangs to provide man-power sufficient to dislodge and throw the track. That it is a considerable item of expense, too, is indicated by the reporting of slightly more than 300,000 man hours for a year on a system of 10,000 miles of track. This is equivalent to 125 men per year working 300 eight-hour days.

One of the most efficient of the types of track liners noted above has enabled a gang of 6 men using three liners to throw track through a turnout which 14 men on lining bars were unable to move. In another instance 4 men using two liners threw track with no more effort than 14 men on lining bars. This lessening of the strain upon men is an important feature. A number of comparative tests to determine the relative performance of gangs with lining bars and with track liners developed that a saving of 37 per cent was effected by the latter.

Applying that saving to the above use of 125 men per year, there is a reduction of 37 per cent of 125 or 46 men per year in accomplishment of the same amount of lining. Extended to all roads of the country, as is rapidly being done, there is again a considerable return of labor for other effective purposes.

#### Mechanical Cranes and Ditching Machines

These machines are finding an endless field for the production of economy and avoidance of concentration of large masses of men for common and arduous labor. They are substituting for labor in the maintenance of ditches, widening of banks, cleaning ballast, handling and laying rail, erection of bridges and other structures, driving piles, loading and unloading ties and the general handling of maintenance materials of all character at storehouses and on the line of road.

The labor saving effected by these machines is reflected in the cost per ton and is only restricted by the impracticability of application to certain materials of small dimensions not susceptible of assembly in bulk. The amount saved per ton is dependent upon a number of factors such as the character, shape and dimensions of the material handled, and naturally, it is not a uniform figure. An indication of an average saving is given by the following record of a recent operation in cleaning stone ballast with a locomotive crane and car ballast screen, compared with the same work by hand:

	Average Costs	
	Per Mile	Per Ton
By locomotive crane.....	\$ 800.00	\$ 0.36
By hand (ballast forks).....	2,490.00	1.12

The locomotive crane, although requiring a gang for removing the old material from the cribs, handled it across the screen so efficiently as to save approximately \$0.76 per ton or 67 per cent as compared with cleaning with ballast forks. It is a suggestion of the economies now being secured by the use of such equipment.

The reduction in the number of men required for the work of screening alone is even more striking; the locomotive crane crew, including train crew and all helpers about the screen, consisted of 10 men. They averaged 300 cu. yds. or the equivalent of 360 tons per day. The same output by hand labor with forks would have required 60 men.

The facility for mass production and consequent assurance of completion of programmed work, with minimum force and least interference to traffic, provided by ditchers, locomotive cranes and other mechanical cranes is one of the most important exten-

sions of the use of machines in place of labor in maintenance of way work.

#### Rail Laying Machines

Mechanical cranes as described above are adapted to the work of laying rail. Here also, a saving corresponding to that indicated in cleaning ballast, is made in the actual handling of the rail. The rapidity with which it is possible to set the rail in track forces the assembly of enlarged gangs, but has the merit of a great reduction in the time of interference with traffic.

Smaller cranes operated by hand designed for the special purpose of laying rail have also proven most efficient. They too, speed the actual placement of rail and consequently require an increased size of gang with corresponding improved performance and decrease in traffic interference. With these cranes 5 to 7 seven men do the same work of placing the rail in track that is done by 16 to 20 men with rail tongs.

The saving in labor in the whole operation of rail laying by the use of cranes varies widely. An average of results from reports of comparative performances under similar conditions indicates a decrease of one man hour per ton of rail laid where the rate by gang using tongs was four man hours per ton or a saving of 25 per cent.

On a system where 100,000 tons of rail may be laid out of face, requiring 400,000 man hours, there is possible a saving of 100,000 man hours. Throughout the country it is now not uncommon to lay three million tons per year. At least one-half of this would be laid under conditions warranting the use of machines. The saving in labor would be 1,500,000 man hours.

#### Motor Cars

The use of the internal combustion engine for small railroad equipment followed closely upon the progressive developments in that field of engineering. Prior to that time the hand-car was the accepted method of transporting maintenance of way men and materials. The widely ranging area of their work, the long distances to be traveled daily, the frequent emergency calls to distant locations and the general isolation particularly of track men, called for the substitution of some improved mode of transporting them as the demands of the work required.

The motor car has met this need and has come into extensive use. Generally in outlying sections their use will effect ample savings to justify their adoption. On an average track section employing six men, requiring four miles of travel time daily, a motor car will easily afford a net saving of \$0.50 per day as compared to hand car operation, and conserve the equivalent of the time of one man for two hours. In a year of 300 working days this would give a net saving of \$150 per year and conserve the time of one man for 600 hours or 75 days. There are probably 20,000 track sections in the country where such use of motor cars has been and can be made. Situations in the bridge, building, water station, signal and electrical forces will add at least 50 per cent more. Expressed in terms of workmen relieved of the unproductive task of "pumping hand cars" it has given and promises the return of the equivalent of 7,500 men for productive work.

#### Other Labor Saving Equipment

The preceding review covers some of the machines which have shown the greatest conservation of labor

in maintenance of way operations. There are many others now extensively used and giving large economies in maintenance labor including the following:

Weed removers	Pile drivers
Bonding machines	Steam shovels
Power drills	Unloading plows
Rail saws	Track barrows
Welding machines	Cement guns
Spreader cars	Paint sprayers

These and many other devices, along with improved materials are fitting themselves in regular maintenance of way practice. An enormous conservation of man power has already been realized by the roads of the country in their adoption of and service from the various improved materials and equipment now on their lines.

Scientific investigation and practical analysis of results have combined to give stability of action in the

provision and use of serviceable and economic materials and machines. The continuation of those practices will develop improved designs, better service from existing equipment, machines of greater efficiencies and an ever-increasing number of appliances invented to relieve the burden which yet demands heavy toll in lowered production from the hands of unskilled labor.

Science will never rest until mechanical development has provided for complete substitution of mechanical methods for the hand methods that unskilled labor yet pursues. Industry will ever demand the mass production which only can serve the needs of a land as progressive as ours, and which only can be realized when the output of each workman will be measured in terms of quantity production—units handled—rather than man hours served.

## Immigrant Labor Supply Reduced

**T**HE NEW LAWS restricting immigration passed in 1921 and 1924 have reduced to almost negligible figures the supply of labor from abroad of the classes available for railway track and other maintenance of way work. The 1924 law, which changed the basis for computing the quotas allowed admission to this country in two particulars, has now been in effect for over a year and a half and the statistics compiled by the Department of Labor for that period show conclusively that the railways must look elsewhere than to the countries of Europe, from which a large proportion of their labor for this class of work was formerly recruited.

The immigration act of 1921 took as a basis for the admission of immigrant aliens to this country the number of foreign-born persons from each country in the United States as shown by the census of 1910, allowing 3 per cent of that number yearly, while the law approved May 26, 1924, effective on July 1 of that year, applies only 2 per cent to the census enumeration of 1890, which makes a great deal of difference in the number admitted from certain countries of Europe from which the railways had drawn much of their labor supply. For example, the quota for 1924 under the old law provided for the admission of 357,804 immigrant aliens, a considerable increase over the number admitted in the two preceding years, but for the fiscal year ended June 30, 1925, under the new law, the quota provided for only 164,667 and the number actually admitted and charged against the quotas was 145,971. Canada, Mexico and South and Central America, however, are exempt from quota limitation, immigrants being admitted on the basis of their qualifications, and one result has been a large immigration of laborers from Mexico in addition to the considerable number that are "bootlegged" across the border.

"Perhaps nothing, aside from limiting the number of arriving immigrants, is more striking than the changes that have been wrought by restrictive immigration measures in the sources from which we now draw the bulk of our immigrants," says the commissioner general of immigration, Harry E. Hull, in his annual report for the year.

This is illustrated by the following table, showing the number and percentage of aliens of races indigenous to northern and western Europe, southern and eastern Europe, and other countries, for the years 1907 and 1914,

Washington, D. C.

the years of heaviest immigration, as compared with the five years, 1921 to 1925, of restrictive immigration:

**IMMIGRANT ALIENS ADMITTED FROM SPECIFIED AREAS**

Fiscal year ended June 30	Number admitted	From—			Per cent of total					
		Northern and western	Southern and eastern	Other countries	North- ern	South- ern	Other Europe	western	eastern	Other Europe
1907	1,285,349	281,322	956,019	48,008	21.9	74.4	3.7			
1914	1,218,480	233,855	921,160	43,465	20.8	75.6	3.6			
1921	805,228	206,995	537,144	61,089	25.7	66.7	7.6			
1922	309,556	129,434	141,621	38,501	41.8	45.8	12.4			
1923	522,919	274,507	162,695	87,717	52.5	31.1	16.4			
1924	706,896	339,342	192,599	120,955	55.6	27.3	17.1			
1925	294,314	222,701	31,883	39,730	75.7	10.8	13.5			

According to the reports of the commissioner general of immigration the total real immigration for the fiscal year 1925 was 294,314, compared to 706,896 for the previous year, a decrease of 412,582, or 58.4 per cent, immigration from the Old World having declined 235,165 and from the New World 177,417. These figures include both quota and non-quota immigrants. Of the total 148,366 came from Europe, as the country of last permanent residence and 102,496 entered via the Canadian border and 32,293 via the Mexican border. Of the total 163,252 were males and of these 34,784 were classed as laborers, while 51,278 were classed as skilled. The latter class included 1,037 blacksmiths, 5,548 carpenters, 795 engineers, 1,317 iron and steel workers, 2,022 machinists, 1,361 masons, 2,840 mechanics, 327 metal workers, 1,467 painters and glaziers and 296 tinnery workers. Of the laborers 10,046 came from Europe, while 8,806 came from Canada and 15,379 from Mexico.

For the six months ended December 31, 1925, 144,148 immigrant aliens were admitted, of which 74,029 were males. Of the total 77,351 came from Europe, and 47,320 came via the Canadian border and 11,881 via the Mexican border. The total included 13,524 laborers and 25,748 skilled workers, including 402 blacksmiths, 2,215 carpenters, 348 engineers, 634 iron and steel workers, 946 machinists, 517 masons, 1,523 mechanics, 210 metal workers, 705 painters and glaziers and 117 tanners.

The report of the commissioner general describes the work of the border patrol in attempting to prevent smuggling of aliens but the department has no estimates of the number that enter the country illegally.

While a large number of bills have been introduced into Congress at each session which if passed would have the effect of greatly increasing the number of aliens to be admitted each year, Congress as a whole seems to be fairly definitely committed to the policy of restriction.

# What is the Measure of the Value of a Labor Saving Device?

What Conditions Must a New Unit of Equipment Meet to Warrant a Maintenance Officer in Accepting It?

By A. N. REECE

Chief Engineer, Kansas City Southern, Kansas City, Mo.

THE VALUE of any labor-saving device must rest primarily upon the ability to perform with it a greater quantity of work of the same or better quality than is possible with hand labor; in other words, upon its ability to decrease labor costs without sacrificing quality. The fact that it is possible to do a larger amount of work with the same number of men, or cover a greater territory with a machine or tool recommended as a labor-saving device, is no recommendation for its use if the work performed will not stand up as well as work done by hand, and if the cost over a period of time will equal that of hand labor. Nor is its purchase justified if the first cost and the maintenance expense over its normal term of usefulness is greater than when performed by hand labor. Many other considerations enter into the measure of the value of a tool, machine or other device intended to reduce labor costs. The exception must be made, of course, that in periods of extreme labor shortage it is often desirable or necessary to use devices to do work ordinarily performed by hand labor, even though the unit cost is greater.

## A Careful Analysis Is Necessary

The first step necessary in considering the value of any labor-saving device is a careful and logical analysis of the possible savings that may be made. The maintenance officer himself must be "sold" on the merits of the device before he can hope to convince his superior officers of its value. The principal points that must be considered in relation to new labor-saving devices may be summed up as follows:

1. Dependable information concerning the real merits of the equipment must be obtained from every reliable source.
2. Its first cost must be considered.
3. The expense of maintaining the device over a period of years must be ascertained.
4. The possibility that the equipment will fail to do the work in a manner that will conform to the existing standards of the railroad must be considered.
5. Will the work performed by the device cause additional expense that will offset or exceed the savings expected?
6. Will the device be serviceable over a sufficient period of each year to justify its purchase and use?
7. Can it be used on all parts of the line, or will its use be restricted to certain districts or divisions?
8. Will its use involve interference with traffic or added expense to the transportation or mechanical departments, that will more than offset the savings that may be effected in the maintenance of way department?
9. Is it thoroughly safeguarded to avoid the liability of personal injuries to either employes or the public?

In the case of devices or equipment which have been



Labor Saving Equipment Must Prove Its Worth

tested over comparatively long periods and whose merits have been proved by results, it is comparatively easy to secure dependable information and determine the relative merits of particular types. The task of securing reliable data and analyzing the possibilities of the equipment is much more difficult when considering a new device or machine, the service worth of which has not been demonstrated by actual use. Its adoption or rejection depends largely upon the judgment of the maintenance engineer or other officer in charge of maintenance.

On many railroads where the funds available for betterment work are limited and must be stretched to cover needed facilities in many departments, the first cost of a labor-saving device is an extremely important consideration. Particularly is this true of the larger machines requiring a considerable initial expenditure. Many times when the merits of a machine are recognized, it is felt that the interests of the railroad and of the public would best be served by the expenditure of available funds on facilities where the need is urgent or the immediate return greater.

As every maintenance officer knows, there have been many devices offered as labor savers which have required large expenditures for maintenance and the correction of faults that have developed in use. Other devices, while performing the work satisfactorily, have required so much maintenance that it has been doubtful whether their purchase and use has resulted in any real saving.

The maintenance standards of most railroads have been developed over a long period of years, and the possibility that the work performed by the proposed device will not be in conformity with these standards must be given consideration. There may be cases where a particular standard might be changed without detriment, or even with positive advantage. In general, however, the standards have been formed as a result of considerable study and experience as giving the best results, and their change to meet the performance of some new device or machine would not be justified. There is, of course, no saving in the purchase of a machine or device intended to reduce labor costs, if its use brings about other expenses which will offset or exceed the expected economies. Unless the adoption of a labor-saving device will really result in a net saving, the advisability of its purchase is doubtful.

It is extremely difficult in many cases to justify the purchase of a labor-saving device that can be used

only a few weeks each year, especially if the initial cost is high, for the savings during the period when it can be used will have to be great enough to warrant the investment. The same reasoning applies to the question of whether the device under consideration can be used on all parts of the line, or will be restricted to certain districts or divisions. On a small railroad this may be a determining factor in its purchase.

There is also the question of whether the proposed equipment will interfere with the uninterrupted movement of traffic, or will add to the expense of operation of trains, or the maintenance of the equipment. As the principal business of a railroad is the transportation of passengers and the movement of freight, the purchase of equipment which will add to the expense of transportation, even though it may lessen the cost of track maintenance, is not justified.

Above all, the maintenance officer must consider whether the proposed device is properly safeguarded so that there will be no liability of personal injuries to either the men handling it or to the public.

#### The Manufacturer's Point of View

Railroad managements are often criticized by manufacturers of railroad supplies, or by their sales representatives, because of their seeming reluctance to adopt so-called labor-saving devices and their failure to take advantage of the opportunities for economy that, in the opinion of the manufacturer, may lie in some particular device. There may be some justice to their criticism. There may be individual maintenance officers who are prejudiced against any new device, but they are decidedly in the minority. Most maintenance officers are quick to recognize the value of any device of real merit, but the merit must be real, and plainly apparent, if they are to have any success in getting permission to try it out. The reasoning or glowing promises of the railroad supply manufacturers interested in selling their devices or equipment, however sincere they may be, or however convinced of the merits of their products, are not enough in themselves to extract from a management looking for results the funds necessary for the purchase of such devices. The maintenance officer considering the advisability of adopting any labor-saving device must weigh many points carefully. This consideration often irks a salesman and indicates to him a feeling of reluctance or a lack of interest as responsible for the delay in his making the sale, or his failure to put across the sale with the particular individual with whom he may be dealing.

While the manufacturer may in some instances have just reason for feeling that his device or equipment has not been given the consideration it deserves, he should in all fairness consider that there are a great many factors to be dealt with. The failure to sell a new device is frequently due to the inability of the manufacturer or his representative properly to present its merit or to show that it will really be a money saver.

#### Authority for Purchase

After the maintenance engineer is convinced that the purchase of any particular tool or machine is justified, he then has the task of convincing the officer responsible for the expenditure of funds that this purchase should take precedence over other items. To be successful in this he must show that the equipment or device is dependable, that it will be used for the purpose intended, and if purchased will give returns

sufficient to justify the diversion of funds from other much-needed facilities demanded by the public which will also offer returns and which, if provided, will enable the property to compete better with other railroads for business.

Railway supply manufacturers or their representatives have often charged that the officers responsible for the expenditures are ultra-conservative in the purchase of new equipment or devices. This criticism should not be improperly construed. There are many devices offered to the railroads which are not practicable, are not well designed, and which will result in greater expense in following up and correcting conditions brought about by their use. Many of these so-called labor-saving devices have been absolute failures, and because of such experiences the officers responsible for the expenditure of funds cannot help but consider them with caution. Regardless of this, if a device has real merit and will do even half the things claimed for it, there is little doubt but that the maintenance engineer on any well-managed railroad will be successful in securing an appropriation for at least a trial order to demonstrate its use.

#### Use of the Equipment

Having been successful in gaining approval for the purchase of a device, the maintenance officer must then see that his forces are properly instructed in its use and understand its operation, and are also convinced of its advantages over the methods of performing the various operations formerly in use. This feature is by no means the least important in the introduction of new devices intended to perform by mechanical means what was formerly done by hand, or to increase the efficiency of labor.

It is a characteristic trait of human nature to think that the old or existing ways of doing work, which have been tried and found dependable, are the best. Especially is this true of men who have learned only from their own experience. Such men are slow to take up new ideas or devices, and must be convinced of their merits before they will acknowledge their worth. This attitude, which has been responsible for the condemnation of many so-called labor-saving devices by those expected to use them, is in most cases due to their not being "sold" on their merits.



Position-Light Signals on the Pennsylvania

# Is The Repair of Work Equipment Being Neglected?

Have the Methods in Use "Like Topsy, Just Grown," or Are They Devised Specifically for the Task?

By C. R. KNOWLES\*

Superintendent Water Service, Illinois Central, Chicago

**F**EW REALIZE the large amount of money invested by the railroads in work equipment and labor saving devices of one kind or another. A check of the work equipment report of one railroad shows more than 4,500 pieces of work equipment on wheels alone with perhaps a like amount of other equipment, unmounted, while another road with 3,500 miles of lines reports an investment of approximately \$3,750,000 in the equipment provided for this purpose.

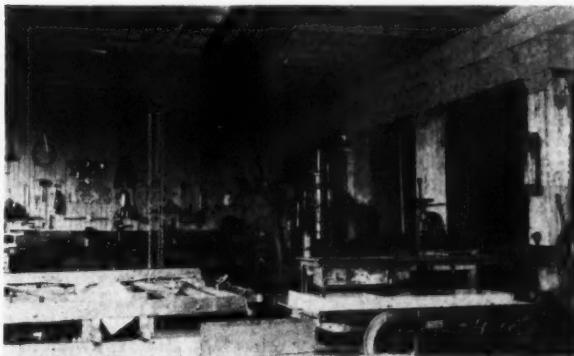
When the mileage of all of the railroads is taken into consideration it is apparent that the total value of such equipment represents an enormous investment. Those who are charged with the responsibility for maintaining and operating this equipment are naturally concerned with the question of realizing the maximum return upon the amount of money invested. It is apparent that if an adequate return is to be realized the equipment must be used consistently and as required. In order to obtain this objective, systematic and efficient maintenance is necessary.

## Equipment Must Be Operated Properly

One of the first essentials to the proper maintenance of work equipment is its care and operation as the cost of maintenance and the time that such equipment is out of service for repairs are determined very largely by the manner in which it is operated. Too much emphasis cannot be placed upon the importance of operation as no matter how efficient the machine may be as a labor saving device the maximum efficiency cannot be obtained if it is operated in an indifferent manner without regard to the details of maintenance essential to satisfactory operation and continued performance.

The lack of proper care, the use of improper oil for lubrication or failure to lubricate properly, and neglect to observe small details such as loose bolts, connections, etc., are responsible for much of the maintenance and delay in operation of the average labor saving device. This is particularly true of machines equipped with or driven by internal combustion engines, for while the modern gasoline or oil engine is a reliable prime mover in proper hands its satisfactory performance is dependent almost entirely on the manner in which it is handled.

\*Although Mr. Knowles is superintendent of water service on the Illinois Central System he has also been given supervision over the operation and maintenance of motor cars, tie tampers and similar equipment and more recently of all work equipment.



A Shop for Motor Car Maintenance.

The labor saving equipment used on our railroads is, in general, reliable if properly handled, and almost without exception failures of such devices or equipment can be traced directly to either indifference or neglect by the operator or to the ignorance of an inexperienced operator. In either case the failure has been due to neglect to observe the important details of operation and maintenance that would naturally be expected from a careful and efficient operator.

Much of the abuse of machine and equipment resulting in poor operation and high cost of maintenance may be traced to poor supervision, for while an operator occasionally takes interest enough in a machine to follow his own initiative he is the exception rather than the rule.

Inspection and adjustment of all parts of machines and equipment is an essential part of its successful operation. They should be inspected carefully at frequent and regular intervals. By this means loose bolts and nuts or other parts out of adjustment which at the time may not be serious, may be discovered and quickly remedied. These details, if not promptly attended to, will invariably become worse and usually result in serious trouble and delay with incident expense. Cleanliness and proper inspection go hand in hand, for the thorough inspection of the machine or equipment demands that it be clean. As a rule nothing will add more to the appearance and efficiency of equipment than keeping it clean. It is an axiom that a clean machine rarely gives any trouble.

## Attention Must Be Given to Storage Conditions

While it is important and essential that proper care and attention be given the machine while in use it is of almost equal importance that it be given like consideration when not in service, at least to the extent that it is protected from the elements and its natural enemies, rust and decay. If the suspension of operation is temporary or of short duration such equipment may be stored in tool houses, freight houses or other convenient buildings. In the event that such shelter is not available tarpaulins or temporary plank shelter should be provided and precautions taken to guard against loss or damage to loose parts of the machine or those parts easily removed. This is particularly true of the smaller items of work equipment such as motor cars, power drills, tie tampers, nut tighteners and other similar equipment. If the season's work is

completed the equipment should be sent to the shop promptly where it can be repaired if necessary, overhauled and stored for use when required.

#### The Organization for Maintenance

Most railroads have an organization of some kind for the purpose of making repairs to motor cars, work equipment and other maintenance of ways devices. Unfortunately, however, it is not always organized in such a manner that the desired results are obtained, chiefly through failure to co-ordinate the work by proper supervision.

On most of the larger roads sufficient work equipment is in use to justify the employment of supervisors of work equipment and to establish regular maintenance of way shops where repairs may be made under the direction of a supervisor of work equipment who is charged with the responsibility for the condition of all work equipment. With the rapidly increasing use of motor cars in maintenance work nearly every railroad having a thousand miles or more of track should be able to justify one or more shops, wholly under the jurisdiction of the maintenance department for making repairs to work equipment.

Repairs to motor cars and other equipment in all seasonal service will require a certain force in the shops the year around while repairs to other equipment such as tie tampers, weedburners, mowing machines and other similar equipment in seasonal service may be made during winter months or when the equipment is not required. It is desirable that the crews of the larger machines such as pile drivers, ditchers, hoists, cranes and other similar equipment maintain the machines operated by them as far as possible in the field and also in the shops, and when such machines are sent to the shop for repairs they should be accompanied by their crew, as this arrangement not only provides employment for them when the machines are not in use but generally produces more satisfactory results than when the machines are turned over to be repaired by men who are not directly interested in their operation. This is particularly true if the machines are maintained by the mechanical department.

#### Operators Should Be Chosen With Care

The greatest care should be exercised in choosing the operators and crews of work equipment, selecting only men who are conscientious and capable, as the failure of equipment, particularly on the larger jobs, often means serious delays and may easily mean loss of time and money instead of realizing expected economies. The uninterrupted operation of any machine or piece of equipment requires a certain amount of maintenance in the field and many minor repairs may be made without taking the machine or equipment out of service. This work may be performed by the regular field maintainer or, better yet, by the operator of the equipment. In selecting men as operators it should be with the thought of picking men who will be capable of handling these details of field maintenance. It is extremely difficult to fix even an approximate measure of the service to be expected from the various units of work equipment as measured by days or hours of service, for while maintenance is an important factor in the service secured uninterrupted operation of the continued operation of the machine is unavoidable, for even with the best type of construction and maintenance there will come a time when it is necessary to take the equipment out of service for repairs. Where equipment is used for a portion of the year only it may reasonably be expected

that with a proper maintenance organization and proper operation and supervision the equipment should go through the season without any delay for repairs. This result can be accomplished best by having an organization charged solely with the responsibility for the maintenance of equipment, and with such an organization functioning properly 100 per cent efficiency should be secured from such equipment.

With equipment in use the year around it will, of course, be necessary to take it out of service occasionally for repairs. For example, motor cars are usually in year-around service and probably offer the most convenient example of maintenance and operation. At the same time there is no class of work equipment in which maintenance and service vary more widely than motor cars.

For example, one road having 2,000 cars in use reported that records covering a period of five years show that the cars were in service for an average of 22 days out of a 26-day month. Another road having 900 cars reports them in service 96 per cent of the time. Upon comparing their costs it was found that the higher percentage of service was accomplished at a cost of about \$80 per car per year for maintenance, while the cost per car on the first mentioned road was a trifle less than \$50 per car per year. This illustrates the fact that the efficiency of operation increases as the standard of maintenance is increased. On the other hand it must be realized that there is a limit to permissible expenditures for maintenance, consistent with economy; and care must be exercised to avoid over-maintenance, or in other words, creating an outlay for upkeep that will offset or exceed the earning power of the equipment.

Practice as to the maintenance of work equipment and organization on railroads varies to such an extent that it is impossible to designate any existing organization as typical of existing practice. An ideal arrangement would be one or more maintenance of way department repair shops wholly under the jurisdiction of the maintenance of way department, centrally located and equipped with the necessary machinery and tools for handling the repairs to work equipment of all kinds. Stocks of repair parts and supplies required should be carried at these shops in sufficient quantities to anticipate all requirements. The organization should consist of a supervisor of work equipment with sufficient mechanical knowledge and ability to supervise the maintenance and operation of all equipment of this class. He should report directly to the chief maintenance officer of the road and have complete jurisdiction and authority over the maintenance of all work equipment used in the maintenance of way department. Where it is necessary to establish more than one shop for repairs the shop should be under the general supervision of the supervisor of work equipment and directly under the jurisdiction of the divisional maintenance organization. The personnel of the shop organization should depend entirely upon the amount of work required.

Uniform records and costs of operation and maintenance of all work equipment are essential to its economical maintenance and complete records should be kept covering the cost and performance of all equipment. Only a casual survey of maintenance records will show that many railroads do not know what expenditures are actually being made for the maintenance of their work equipment, or the benefits derived from its use; therefore, records of cost and performance are essential to determine the amounts that may be spent for maintenance and new equipment.

# Jacking Culvert Through Embankment Cuts Cost Two-Thirds

Missouri Pacific Demonstrates Marked Economy of This Practice in Two Instances

By W. C. SWARTOUT

Senior Assistant Engineer, Missouri Pacific, St. Louis, Mo.

THE Missouri-Pacific was confronted recently with the problem of correcting a drainage condition which existed on its main line at Plattsmouth, Neb. At the point in question, three lines of 24 in. cast iron pipe had previously been installed. In ordinary seasons these were sufficient to dispose of the surface water that reached them. At certain intervals, however, as in the spring as well as after storms of extraordinary intensity, streets in Plattsmouth on the upstream side near the opening would be covered by water which had backed up against the embankment. Although of infrequent occurrence, the condition noted interfered at such times with normal life in this vicinity. Obviously, a culvert with larger waterway was required to relieve this condition.

## A Comparison of Methods Led to Adoption of Jacking

In selecting the plan to be followed for increasing the waterway, due consideration was given to the methods now in common use for placing culverts under existing track. These methods are as follows:

skilled labor and special equipment. The first method also involved interruption of traffic and that bane of all operating officers, a "slow order," due to more or less settlement of the embankment for a long period after the completion of the job. The placing of a slow order on a piece of track for any reason, while necessary for safe operation, results directly in an indeterminate but certain additional expense for the operation of every train over that piece of track. The second method involves less traffic interference and less embankment settlement than the former, but its probable cost was such that it was not considered very seriously.

In view of the serious objections to both of these methods, recourse was had to another method now available to railroad engineers. The method referred to is that of jacking the culvert through the embankment. While this is not a new method, as it has been used on various railroads on a number of occasions in recent years, it is but little used, due, no doubt, to the fact that it is not equally adaptable to

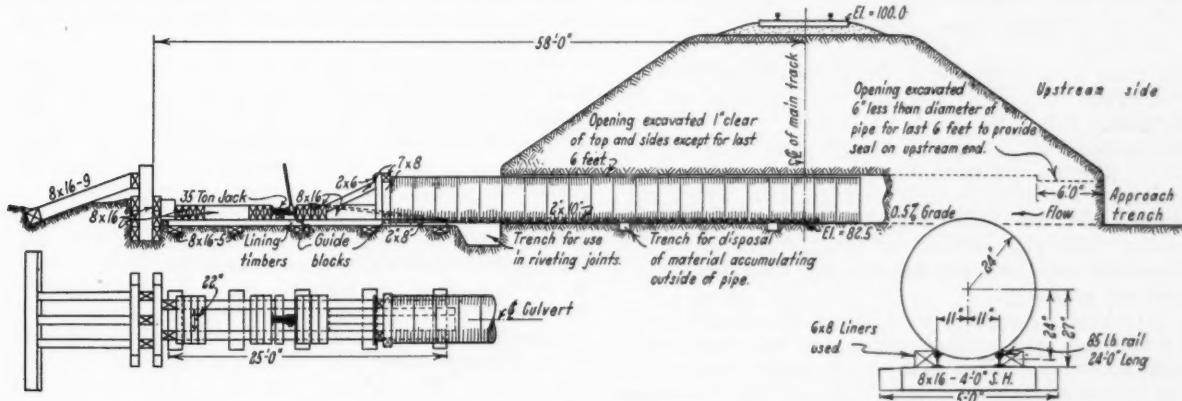


Diagram Showing the Method of Installing the Culvert

1. Trench the embankment after driving a temporary pile trestle to support the track over the excavation, which would also to some extent hold the ends of the embankment; build the culvert in the excavation and replace the embankment over it. The height of the fill would have necessitated driving two sets of piling, the first set permitting the trenching of the embankment when the second set would be required to carry the track.

2. Tunnel through the embankment, leaving an opening of sufficient size to permit building the culvert inside of it; and backfill the space remaining between the culvert and the embankment.

Both of these methods would cost large sums to carry out, tie up a bridge gang for a long period at a time when they were urgently needed on the regular bridge program work, and in addition require

all types of materials. It requires a culvert which, during the jacking process, will act as one unit, regardless of how many individual sections it may be composed. Recently this method has been developed by the Armco Culvert & Flume Manufacturers Association to the point where all uncertainties have been practically eliminated. Furthermore, this method can be carried out with entire safety to the men engaged, insofar as caving material is concerned, since it is an adaption of the shield method of tunneling.

Investigation indicated that the jacking method of placing a culvert under existing tracks would not only eliminate objections against other available methods, namely: traffic interference primarily, and embankment settlement, but also could unquestionably be employed at a considerable saving in cost. As these were important considerations on this division of the

Missouri Pacific Railroad, this method was adopted and the assistance of the Armco Culvert & Flume Manufacturers Association obtained in planning and executing the job.

After careful investigation of the situation, including a careful survey of the watershed, it was found that about 18 sq. ft. of additional opening was required, and, accordingly, a 60 in. 8 gage Armco corrugated iron pipe was selected as best adapted to all the requirements of the case. In addition to the recognized qualities of strength and durability exhibited by this pipe in actual railroad service, it also has the important advantage of being admirably adapted to jacking through an embankment.

#### The Plan of Execution

The flow line of the culvert is 33 ft. below base of rail on the upstream end and 36 ft. on the downstream ends, requiring 122 ft. of pipe. Of this length 68 ft. was jacked, the balance being placed on the ends in open excavation. The pipe was unloaded from a



A Side View of the Back Stop.

side track about 800 ft. from the proposed culvert location. From this point the pipe was rolled to the site by hand. When the work was ready to start, it was determined that a regular bridge gang was not required, therefore a special gang was organized, consisting of a regular bridge foreman, two bridge carpenters and four to six laborers, the latter recruited locally. This plan worked out satisfactorily, as skilled labor was required only for framing the jacking timbers and backstop.

A jacking job of this kind should be started at the downstream side so that any water will drain away from the work, and it had been planned to do so in this instance. It was found, however, that there was insufficient right of way on this side, consequently the work had to be prosecuted from the upstream side of the embankment. As a result, some heavy rains during the progress of the work entailed the loss of considerable time, due to having to clean mud and water out of the pipe.

Before actually starting the jacking, a trench was dug into the slope of the embankment to a point where the time required for hand excavation began to exceed that of jacking. This point was 18 ft. from the toe of the slope and at this point the jacking began. The embankment consisted of well-compacted soil (loess) typical Missouri River Bluff formation, which supported itself well in the trench so that no sheeting was necessary and was generally found to be very favorable for this method. This soil characteristic also permitted the digging of a hole from the end of the trench into the embankment in advance of jacking operations; this hole being slightly larger than the diameter of the pipe and about eight feet long, which

reduced the cost of the work by reducing the amount of dirt to be wheeled out through the pipe.

A word of caution should be mentioned here. Any initial advance of the heading without the protection of the pipe as a shield should be made only with extreme care and in material which is known to be cohesive and to a large degree self-supporting, for a comparatively small cave-in may easily cause serious regrettable personal injuries which would result in large personal injury claims.

To guide the pipe while being jacked, a bridge stringer was embedded in the bottom of the trench, projecting one inch above the bottom. It followed the center line of the culvert location and was brought to correct grade. The alignment of the pipe was checked against a chalk line stretched between the two points that were both on line and grade. The effectiveness of this method is indicated by the fact that when the pipe cut through to the other side, it was practically on grade and only about six inches off alignment.

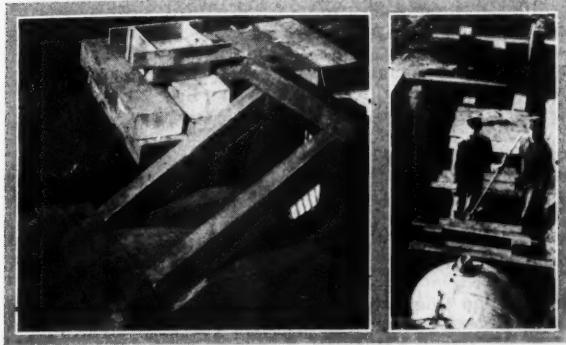
On another similar later piece of construction on our line near Claremore, Oklahoma, where we jacked a 42-in. culvert about 56 ft., two such guides were used, spaced about 18 in. (this distance will vary with the size of the pipe) apart. These guides may be 85 lb. rails but preferably second hand bridge stringers. They should be tied together about every 8 or 9 ft., using a bridge stringer cut in pieces about 4 ft. long as cross ties, the latter being firmly bedded in the natural ground so that the guides will not deviate from the desired line and grade. On this job the pipe followed the desired line and grade much better, there being no appreciable deviation from line while it rose about 2 in. in 62 ft. This leads to the conclusion that two guides are better than one, especially with the larger sizes.

A backstop against which the jacking was done was constructed by standing 21 bridge ties on end and side by side in a trench dug at right angles to the center line of the culvert. Against these ties were placed two sets of 12 in. by 12 in. bearing blocks and against these the jacks butted. A framework consisting of 6 in. by 8 in. timbers was constructed to fit over the end of the pipe while it was being jacked. The bottom timber of this frame rested on the lining timber in the bottom of the trench. An 8 in. by 16 in. timber was placed against each side of the frame for a jacking block, and reaching from each of these blocks to its corresponding jack was an 8 in. by 10 in. jacking timber. The jacking was done at first with two 25-ton jacks which were later replaced by two 50-ton jacks which had twice the travel and consequently required resetting only half as often. While a solid backstop is essential, it was the conclusion of all who witnessed the work that the backstop described above was more substantial by far than the pressures necessitated.

Inside the pipe the dirt was excavated by two men with short-handled picks and shovels and removed by another man with a wheelbarrow. A fourth man acted as a "booster engine" by helping to pull the wheelbarrow out of the trench with a rope. This permitted full loads and rapid work. The average rate of excavating inside the pipe was about 6.5 lineal feet per day. The embankment was removed ahead of the pipe for a distance of about two feet, the hole having about 4 in. greater diameter than the pipe. The pipe was then jacked the two feet and the process repeated until the entire section had been jacked into the fill, except for about two feet left out on which

the next section was riveted after being rolled into the trench. The sections were 16 ft. long. This process was continued until the pipe cut through the last shell of dirt into the trench which had been dug into the toe of the bank on the other side. At this point jacking ceased and the remainder of the pipe was lowered into the trench and riveted on. Backfilling over the exposed ends of the pipe and removal of jacking timbers completed the job.

As previously stated, the work was done with a gang of men picked up largely at Plattsmouth. This gang consisted of eight men, of which four men operated the jacks; until the last stages, when six were required; two excavated within the pipe, one removed the dirt in a wheelbarrow, and one helped pull the



A Jacking Frame Distributes the Pressure to the Parts.      Jacking the Pipe in the Trench.

loaded wheelbarrow out of the trench. When there were trenches to dig, pipe to move, or jacks to change, all hands turned to the work of the moment. Outside of supervision, this crew handled all the work except unloading the pipe and rolling it to the site without additional help, with the exception that when two sections of pipe had to be moved from one side of the embankment to the other, a passing pile driver was pressed into service.

#### The Cost of the Work

The entire job was completed in 25 days, and its total cost, exclusive of the cost of the pipe, was \$960.30, divided as follows:

##### Handling Pipe:

Unloading and rolling to site.....	\$ 40.10
Moving pipe at site.....	8.00
Use of pile driver crew.....	6.00

##### Earthwork:

Excavating trenches .....	486.20
Excavating in pipe.....	
Backfilling .....	40.00

##### Jacking:

Placing timbers .....	17.05
Riveting pipe .....	19.20
Jacking .....	343.75
Cost of timbers.....	No Chg.
Use of jacks.....	No Chg. 380.00

Total cost ..... \$960.30

The estimated cost of placing a 60-in. corrugated pipe culvert under a 35-ft. embankment by the open trench (pipe not included) was \$3,500, showing a minimum saving of about \$2,540 in favor of the method employed. On a direct comparison of methods, however, the differential in favor of the jacking method would be greater than this as the necessity of jacking the pipe from the upstream side of the embankment, entailing additional expense for cleaning mud out of the pipe after a rain and the expense of transferring

two sections to the opposite side, will not generally arise and should not be charged against this method. Then again, the timberwork, especially the backstop for the jack, was undoubtedly much more substantial than necessary. As the timber, however, was on the ground, it was thought best to take advantage of it rather than run the risk of having insufficient support for the jacking process.

The Claremore installation, which was performed after the Plattsmouth work, was planned in more complete detail before the work was undertaken. As a consequence it was handled more efficiently. The detailed costs here were:

Handling Pipe:	
Moving to and preparing for work.....	\$ 8.90
Unloading pipe from car.....	21.05
Trucking to site and placing on skids.....	13.44
	\$ 43.39

Preparation:	
Constructing skids to carry pipe until rolled into approach trench.....	\$ 8.96
Excavating approach trenches.....	35.75
Setting timber guides.....	11.20
Cutting and placing blocking.....	8.96
Construct jacking frames and blocks.....	8.96
	73.83

Jacking:	
Jacking pipe and excavating soil.....	\$105.28
Connecting and riveting pipe.....	10.08
	115.36

Cleaning Up:	
Removing jacking block.....	\$ 2.24
Removing blocking, backfilling, loading tools, and blocking.....	17.92
Rebuilding 16-ft. fence.....	1.12
	21.28

Engineering and Supervision.....	54.36
	\$308.22

Total Labor.....	
Material:	

New only, pipe not included and no charge for second hand material used.....	\$ 13.45
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This work progressed at the rate of 8.64 ft. per eight-hour day with 4 men, including riveting the three sections together and all incidental work; time being computed from the time the first section was rolled into the approach trench until the job was complete. Reference has been made to the use of two guide timbers in the approach at this point. On this job the entire culvert was jacked into place except the portion in the open approach trench on the upstream end.

#### A Summary of the Advantages of This Method

By taking these things into consideration on future jobs, it is estimated that the jacking method will not cost more than 30 per cent to 40 per cent of the cost of placing a culvert of equivalent waterway under an existing track by any other method. This estimated saving is based on a comparison between different methods of placing the same type of culvert—corrugated. If other types of culverts, such as cast iron and concrete, were included in the comparison, the differential in favor of jacking with corrugated iron would undoubtedly be still further increased.

The method of placing a culvert under existing track employed at Plattsmouth as here described proved entirely satisfactory from every angle. It has several very distinct advantages over other methods which may be summarized as follows: (1) Time was saved, for the work was completed with the expenditure of less than one-third the man hours required for the open trench method. (2) There was no traffic interference and no slow orders. (3) Track was safe at all times for no traffic support was required during construction and there was no settlement of embankment under the track after construction. (4) The cost was low for the work was completed for about 15 per cent of the cost by the open trench method.

The project at Plattsmouth was carried out under the general direction of E. B. Fithian, district engineer, C. B. Huffman being the assistant engineer in direct charge of the work. The plans for the work at Claremore were prepared by A. B. Chaney, assistant engineer, who with C. W. Hornecker, supervisor

bridges and buildings, actively supervised the entire installation. A. W. Spaulding, engineer of tests for the Armco Culvert and Flume Manufacturers' Association, Middletown, Ohio, was on the job at both Plattsmouth and at Claremore throughout the time when jacking was being done.

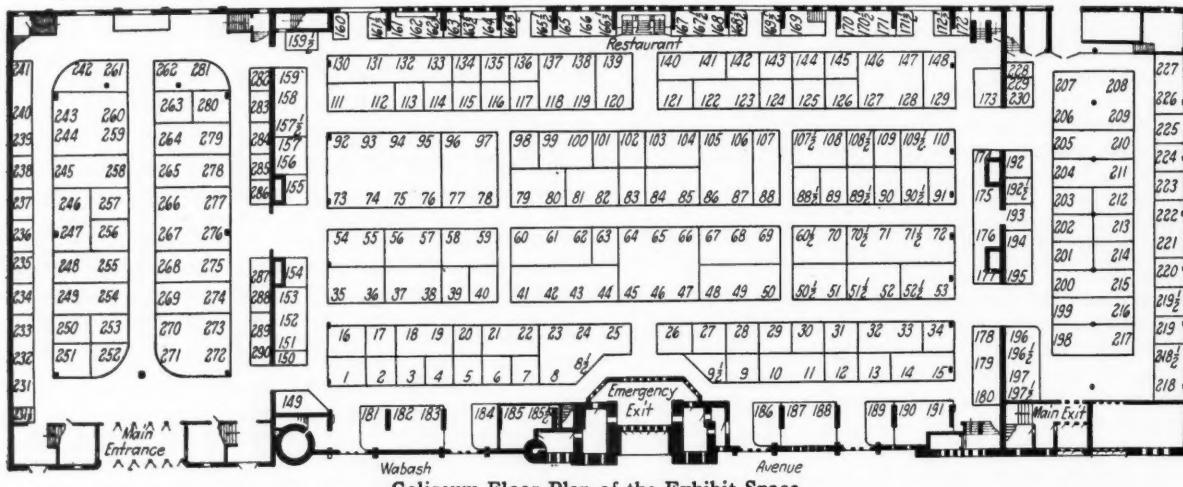
## National Railway Appliances Association To Hold Annual Exhibit

**T**HE National Railway Appliances Association has completed plans for its eighteenth annual exhibit which will be held in the Coliseum, Chicago on March 8 to 11, inclusive. In addition to the main floor of the Coliseum the exhibits will occupy the annex built at the north end last year and the annex at the south end of the main building. A total of 184 companies have arranged for space. As in previous years the exhibit will open on Monday morning, March 8, and will close at 1 o'clock on Thursday afternoon. The exhibit will close daily at 6 o'clock except on Tuesday evening when it will be open until 10 o'clock.

The following is a list of exhibitors:

Adams Motor & Mfg. Co., Chicago, Spaces 218, 218½.  
 Adams & Westlake Company, The, Chicago, Spaces 77, 78, 96, 97.  
 Air Reduction Sales Co., New York, Spaces 167, 167½, 168.  
 American Car & Foundry Company, Chicago, Spaces 242, 261.  
 American Casting Company, Birmingham, Ala., Spaces, 243, 244, 259, 260.  
 American Chain Company, Inc., Bridgeport, Conn., Spaces 81, 82.  
 American Fork & Hoe Company, The, Cleveland, Ohio, Space 235.  
 American Hoist & Derrick Co., St. Paul, Minn., Spaces 37, 38.  
 American Malleable Castings Association, Cleveland, Ohio, Spaces 181, 182, 183.

Automatic Grade Crossing Signal, Chicago, Space 225.  
 Baker R. & L. Company, The, Cleveland, Ohio, Spaces 205, 210.  
 Balkwill Manganese Crossing Co., Cleveland, Ohio, Spaces 50½, 51.  
 Barber Asphalt Company, The, Philadelphia, Pa., Space 163.  
 Barrett Company, The, New York, N. Y., Space 189.  
 Bethlehem Steel Company, Inc., Bethlehem, Pa., Spaces 70½, 71, 71½, 72.  
 Blaw-Knox Company, Pittsburgh, Pa., Space 89.  
 Brach Mfg. Co., L. S., Newark, N. J., Space 234.  
 Brown Rail Loader Co., Boston, Mass., Spaces 229, 230.  
 Buda Company, The, Harvey, Ill., Spaces 45, 46, 47, 64, 65, 66.  
 Burr Adjustable Mail Crane, Chicago, Space 172½.  
 Carbic Manufacturing Co., Duluth, Minn., Spaces 165, 166, 166½.  
 Carey Phillip Company, The, Cincinnati, Ohio, Space 219.  
 Carnegie Steel Company, Pittsburgh, Pa., Spaces 268, 275.  
 Carter Bloxondend Flooring Co., Kansas City, Mo., Space 4.  
 Celotex Company, The Chicago, Space 6.  
 Central Electric Company, Chicago, Space 2.  
 Challenge Company, Batavia, Ill., Space 109.  
 Chicago Bridge & Iron Works, Chicago, Spaces 84, 85.  
 Chicago Malleable Casting Co., West Pullman, Chicago, Ill., Space 142.  
 Chicago Pneumatic Tool Company, New York, Spaces 118, 119, 137, 138.  
 Chicago Railway Signal & Supply Co., Chicago, Space 108½.  
 Chipman Chemical Engineering Co., Inc., Bound Brook, N. J., Space 89½.



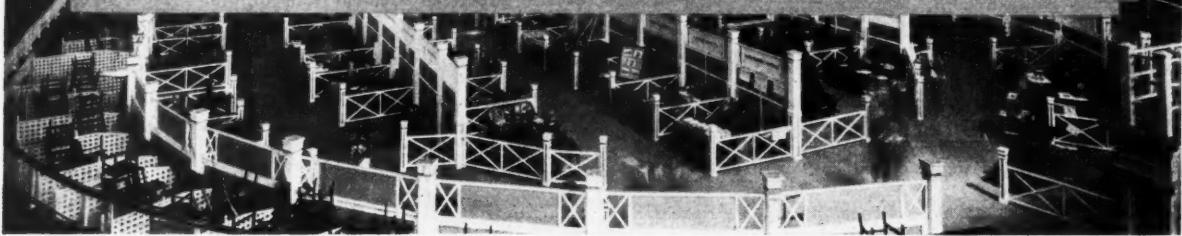
American Railway Hydrant & Valve Co., Stapleton, S. I., N. Y., Space 159½.  
 American Steel & Wire Company, Chicago, Spaces 265, 278.  
 American Valve & Meter Co., The Cincinnati, Ohio, Spaces 130, 131, 132, 133.  
 Ames Shovel & Tool Company, Boston, Mass., Space 186.  
 Anchor Company, Milwaukee, Wis., Spaces 163½, 164.  
 Andrix Lock Nut Company, Adrian, Mich., Space 161½.  
 Arco Anti Rail Creeping Co., Inc., Oswego, N. Y., Space 168½.  
 Armco Culvert & Flume Manufacturers Association, Middletown, Ohio, Spaces 99, 100.  
 Asbestos Shingle, Slate & Sheathing Company, Ambler, Pa., Space 169.

Clark Car Company, Pittsburgh, Pa., Space 115.  
 Cleveland Frog & Crossing Co., Cleveland, Ohio, Space 90.  
 Cleveland Pneumatic Tool Co., The, Cleveland, Ohio, Space 144.  
 Cleveland Railway Supply Company, The, Cleveland, Ohio, Spaces 289, 290.  
 Cook, A. D., Inc., Lawrenceburg, Ind., Space 136.  
 Copperweld Steel Company, Braddock, P. O. Rankin, Pa., Space 13.  
 Creepcheck Co., Inc., The, Hoboken, N. J., Space 214.  
 Crerar, Adams & Co., Chicago, Space 28.  
 Cullen-Friestadt Company, Chicago, Spaces 199, 216.  
 Dearborn Chemical Company, Chicago, Space 251.

- Detroit Graphite Company, Chicago, Spaces 58, 59.  
 Dickey, Clay Mfg. Co., W. S., Kansas City, Mo., Space 116.  
 Dickinson, Paul, Incorporated, Chicago, Space 88½.  
 Dilworth, Porter & Co., Inc., Pittsburgh, Pa., Space 27.  
 Duff Mfg. Co., The, Chicago, Spaces 35, 36.  
 Edison Storage Battery Co., Orange, N. J., Space 20.  
 Edison, Thomas A., Inc., Primary Battery Division, Bloomfield, N. J., Spaces 18, 19.  
 Electric Storage Battery Co., The, Philadelphia, Pa., Space 40.  
 Electric Tamper & Equipment Co., Chicago, Spaces 204, 211.  
 Elwell-Parker Electric Co., The, Chicago, Spaces 200, 215.  
 Engineering News-Record, McGraw-Hill Co., New York, Space 155.  
 Euclid Electric & Mfg. Co., The, Euclid, Ohio, Space 203.  
 Fairbanks, Morse & Co., Chicago, Spaces 73, 74, 75, 76, 92, 93, 94, 95.  
 Fairmont Railway Motors, Inc., Fairmont, Minn., Spaces 41, 42, 43, 44.  
 Fleming & Son Co., J. R., Scranton, Pa., Space 285.  
 Frog, Switch & Manufacturing Co., The, Carlisle, Pa., Spaces 51½, 52.  
 General Electric Company, Schenectady, N. Y., Spaces 270, 271, 272, 273.  
 General Railway Signal Company, Rochester, N. Y., Spaces 48, 49, 50.  
 Graver Corporation, East Chicago, Ind., Space 280.  
 Hackman Railway Supply Co., The, Chicago, Space 224.  
 Handlan-Buck Manufacturing Co., St. Louis, Mo., Spaces 264, 279.  
 Hayes Track Appliance Co., Richmond, Ind., Spaces 140, 141.  
 Hazard Manufacturing Company, Chicago, Spaces 21, 22.  
 Headley Good Roads Co., Chicago, Spaces 157½, 158, 159.  
 Henion & Hubbell, Inc., Chicago, Space 223.  
 Howlett Construction Company, Moline, Ill., Space 284.  
 Hubbard & Co., Pittsburgh, Pa., 103, 104.  
 Hussey Mfg. Co., The, North Berwick, Me., Space 192½.  
 Illinois Steel Company, Chicago, Spaces 269, 274.  
 Ingersoll-Rand Company, New York, Spaces 206, 207, 208, 209.  
 Inland Glass Company, Chicago, Space 236.  
 International Signal Co., The, New York, Space 114.  
 Jaeger Machine Company, The, Columbus, Ohio, Space 30.  
 Johns-Manville, Inc., Chicago, Spaces 174, 175, 176, 177.  
 Jordan Company, O. F., East Chicago, Ind., Spaces 60, 61, 62.  
 Kalamazoo Railway Supply Co., Kalamazoo, Mich., Spaces 8, 8½, 23, 24, 25.  
 Kelly-Derby Company, Inc., Chicago, Space 29.  
 Kentucky Rock Asphalt Co., Inc., Louisville, Ky., Spaces 156, 157.  
 Kerite Insulated Wire & Cable Co., Inc., The, Chicago, Spaces 88, 107.  
 Keystone Grinder & Mfg. Co., Pittsburgh, Pa., Space 193.  
 Keystone Steel & Wire Company, Peoria, Ill., Space 257.  
 Klauber Manufacturing Company, Dubuque, Iowa, Space 202.  
 Layne & Bowler Manufacturing Co., Memphis, Tenn., Space 219½.  
 Lehon Company, The, Chicago, Space 91.  
 Locomotive Finished Material Company, The, Atchison, Kans., Space 143.  
 Lorain Steel Company, The, Johnstown, Pa., Spaces 266, 267, 276, 277.  
 Louisville Frog & Switch Co., Inc., Louisville, Ky., Space 263.  
 Lufkin Rule Co., The, Saginaw, Mich. Space 121.  
 Lundie Engineering Corp., The, New York, Space 90%.  
 90½.  
 Lundy Company, E. A., Pittsburgh, Pa., Spaces 239, 240, 241.  
 MacLean-Fogg Lock Nut Company, Inc., Chicago, Space 1.  
 MacRae's Blue Book Co., Chicago, Space 286.  
 Magnetic Signal Co., Los Angeles Calif., Space 3.  
 Maintenance Equipment Co., Chicago, Spaces 194, 195.  
 Massey Concrete Products Corporation, Chicago, Spaces 54, 55.  
 Mechanical Mfg. Co., The, Chicago, Spaces 245, 258.  
 Metal & Thermit Corporation, Chicago, Spaces 262, 281.  
 Milburn Company, The, Alexander, Baltimore, Md., Spaces 161, 162, 162½.  
 Miller Train Control Corporation, The, Danville, Ill., Spaces 249, 254.  
 Morden Frog & Crossing Works, Chicago, Spaces 69½, 70.  
 Moss Tie Company, T. J. St. Louis, Mo., Space 237.  
 Mudge & Company, Chicago, Spaces 127, 128, 146, 147.  
 Murdock Mfg. & Supply Co., The, Cincinnati, O., Space 134.  
 National Boiler Washing Co. of Illinois, Chicago, Space 12.
- National Carbon Company, Inc., Cleveland, Ohio, Spaces 151, 152, 153.  
 National Lead Company, New York, Spaces 187, 188.  
 National Lock Washer Company, The, Newark, N. J., Space 117.  
 National Malleable and Steel Castings Company, Cleveland, Ohio, Space 102.  
 National Safety Appliance Company, The, Chicago, Spaces 149, 150.  
 National Vulcanized Fibre Co., Pittsburgh, Pa., Space 126.  
 Nelson Mfg. Co., B. F., The, Minneapolis, Minn., Space 172.  
 Nichols, Geo. P. & Bro., Chicago, Space 173.  
 North American Cement Corporation, Hagerstown, Md., Space 285.  
 Northwestern Mfg. Co., Milwaukee, Wis., Space 165½.  
 Northwestern Motor Company, Eau Claire, Wis., Spaces 196, 196½, 197, 197½.  
 Ogle Construction Co., Chicago, Space 31.  
 Ohio Brass Company, The, Mansfield, Ohio, Spaces 255, 248.  
 Okonite Company, The, Passiac, N. J., Space 16.  
 Okonec-Callender Cable Co., Inc., The, Passiac, N. J., Space 17.  
 Oxweld Railroad Service Co., The, Chicago, Spaces 10, 11.  
 Page Steel and Wire Company, Bridgeport, Conn., Space 83.  
 Patterson, W. W. Co., Pittsburgh, Pa., Space 145.  
 Pittsburgh-Des Moines Steel Company, Chicago, Space 98.  
 P. & M. Company, The, Chicago, Spaces 122, 123.  
 Pocket List of Railroad Officials, The, New York, Space 26.  
 Positive Rail Anchor Co., Marion, Ind., Spaces 178, 179, 180.  
 Pyle-National Company, The, Chicago, Spaces 190, 191.  
 Q. & C. Co., The, New York, Spaces 120, 139.  
 Racine Tool & Machine Company, Racine, Wis., Space 212.  
 Rail Joint Company, The, Chicago, Spaces 79, 80.  
 Railroad Accessories Corporation, New York, Spaces 14, 15.  
 Railroad Supply Company, The, Chicago, Spaces 86, 87, 105, 106.  
 Railway Purchases and Stores, Chicago, Space 231½.  
 Railway Review, Chicago, Space 154.  
 Ramapo Ajax Corporation, New York, Spaces 109½, 110.  
 Rawls Machine & Mfg. Works, Chicago, Spaces 226, 227.  
 Reade Manufacturing Company, Jersey City, N. J., Space 256.  
 Reliance Manufacturing Company, The, Massillon, Ohio, Space 135.  
 Richards-Wilcox Mfg. Co., Aurora, Ill., Spaces 170, 170½, 171.  
 Rice Mfg. Co., Indianapolis, Indiana, Space 169½.  
 Roberts Co., The George J. Dayton, Dayton, Ohio, Space 282.  
 Roberts and Schaefer Company, Chicago, Space 34.  
 Robertson Co., H. H., Pittsburgh, Pa., Spaces 246, 247.  
 Robertson & Co., Wm., Chicago, Space 184.  
 Sears, Roebuck and Company, Chicago, Spaces 221, 222.  
 Sellers Mfg. Co., Chicago, Space 124.  
 Sherwin-Williams Co., The, Cleveland, Ohio, Space 125.  
 Signal Accessories Corporation, Utica, N. Y., Space 113.  
 Simmons-Boardman Publishing Co., Chicago, Spaces 287, 288.  
 Sinning Track Liner Co., Ramsey, Ill., Space 171½.  
 Skelton Shovel Co., Inc., Dunkirk, N. Y., Space 9½.  
 Snow Construction Co., T. W., Chicago, Spaces 107½, 108.  
 Southern Signal Co., Inc., Louisville, Ky., Space 238.  
 Sullivan Machinery Company, Chicago, Space 253.  
 Templeton, Kenly & Co., Limited, Chicago, Spaces 32, 33.  
 Torchweld Equipment Company, Chicago, Space 5.  
 Union Switch & Signal Co., Chicago, Spaces 67, 68, 69.  
 Universal Generator Co., The, Blossburg, Pa., Space 250.  
 U. S. Wind Engine & Pump Co., Batavia, Ill., Spaces 111, 112.  
 Verona Tool Works, Pittsburgh, Pa., Spaces 129, 148.  
 Warren Tool & Forge Company, The, Warren, Ohio, Space 9.  
 Waterbury Battery Company, The, Waterbury, Conn., Space 39.  
 Weir Kilby Corporation, Cincinnati, Ohio, Space 213.  
 Western Electric Company, Inc., Chicago, Space 252.  
 Western Wheeled Scraper Company, Aurora, Ill., Space 63.  
 Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., Spaces 56, 57.  
 Wharton, Jr., & Co., William, Inc., Easton, Pa., Spaces 52½, 53.  
 Wood Conversion Co., Cloquet, Minn., Space 220.  
 Wood Iron & Steel Co., Alan, Philadelphia, Pa., Space 201.  
 Wood Shovel & Tool Company, The, Piqua, Ohio, Space 192.  
 Woolry Machine Company, Minneapolis, Minn., Spaces 231, 232, 233.  
 Wyoming Shovel Works, The, Wyoming, Pa., Space 101.  
 Zenith Shovel Company, The, Chicago, Space 7.

# Getting the Manufacturers' Help

Current Developments in New and Improved  
Labor Saving Appliances



## Service Data on a Motor Car Weed Burner

THE WOOLERY weed burner, which was described briefly in *Railway Engineering and Maintenance* for March, 1925, page 117, has been used on a number of roads in the northwest during the last summer as a result of which some data have become available which show the cost of operation and point to the savings to be obtained with equipment of this kind. The burner as shown in one of the illustrations is a three-unit outfit consisting of a burner car on which a refractory lined hood is mounted, a power car equipped with a twin cylinder Woolery engine which propels the outfit and drives a blower to supply the necessary air to the burner, and a tank car carrying the fuel supply.

To burn a heavy growth of weeds an intense heat is necessary and this is supplied by a large oil burner of the atomizing type. The refractory lined hood deflects the flame directly down and into the weeds. The hood



Before Burning.

lining consists of special firebricks which are attached to the hood in such a manner that any brick may be replaced readily without disturbing the others.

Combustion is established in the combustion tube between the hood proper and the blower. The blast of air from the blower introduces a large volume of free air into this combustion tube so that the distillate oil which is used for fuel is thoroughly atomized and supplied with ample air for complete combustion, thus obtaining high efficiency from the fuel used and driving the flame and reflected heat down among the weeds. There

are several advantages to this design as compared with playing the flame directly on the weeds. When the hood lining gets hot after the first few minutes of burning, the combustion is complete and no oil is left on the rails or ties, as would be the case if the flame were played directly on the cold roadbed, in which case the combustion of low grade fuel would not be complete but would



After Burning.

be condensed by striking the cold weeds and rails, thus depositing a film of oil and resulting in a considerable waste of fuel.

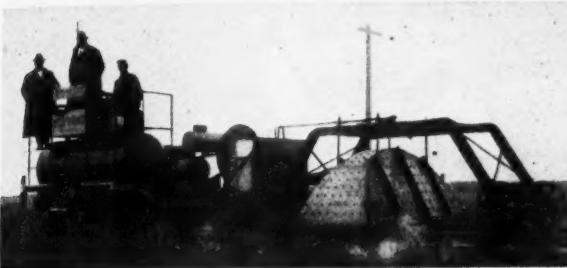
The burner can be lighted instantly without generating and the flame can be shut off when going over bridges and stretches where there are no weeds, and automatically reignited. This feature makes it easy for the operator to adjust the fuel consumption to the requirements. The fuel generally used is a distillate oil having a specific gravity of about 35, although higher grade oils including kerosene may be used.

### The Power Car

A single power unit is used to propel the burner and drive the blower. The design is favorable for the use of one engine, for when the outfit is burning weeds the blower takes by far the larger percentage of power, as but little is required to propel the burner along the track at a speed of from one to five miles per hour. When traveling on high speed the blower load is thrown off by the use of a friction clutch and the full power of the engine is available for traveling.

A standard Woolery twin-cylinder, two-cycle, reversible ballbearing engine is used, developing about 25 hp. The use of this engine provides sufficient power for

any work the burner is called upon to do. Its reversible feature permits the burner to travel in either direction. The blower is driven by a belt off the fly-wheel of the engine and the power is transmitted to the car wheels by a roller chain through a special two-speed transmission. This transmission provides a slow burning speed of one to five miles per hour. The engine is governor-controlled and the operator on the tank car handles the entire outfit by means of a single control. The power car has four drive wheels and braking action is provided on six wheels, four on the power car and two on the tank car. If it is desirable to move the burner from



The Woolery Weed Burner.

one district or division to another it can be done under its own power, or in case of extremely long moves, the entire outfit can be loaded on a flat car.

The fuel supply tank is mounted on an all-steel, ball-bearing car which has a capacity of 575 gal., which is usually sufficient for a full day's burning. A seat is provided for the operator on top of the tank car, where he can view the track in either direction and control the entire operation of the burner.

#### Method of Operation

The labor required ordinarily consists of one operator, a helper and a section crew consisting of a section foreman and two men to follow the burner and put out what small fires may be started in splintered or rotten ties.

The burning destroys all of the weeds between the rails and for a foot beyond the end of the ties. Depending on the type and density of the weed growth it is sometimes found to be cheaper and more effective to burn twice over a given stretch in the same time as would ordinarily be required for a complete burning once over. This practice gives the weeds a chance to wither after the burner has passed over them so that they may be consumed on the second trip. The speed of burning is from 1 to 5 miles per hour or approximately 10 to 20 miles per day. The speed is kept at a rate such that the weed growth is burned, but so that there is not sufficient heat at any one point at one time to burn the ties. There is no danger of setting the ties on fire except where they are rotted badly or splintered and the section men follow to put out what fires may start.

#### Cost of Operation

The cost of operation will vary somewhat, depending on the growth and kind of weeds, the season of the year and the cost of fuel. Burners of this type operating over 4,206 miles during the summer of 1925, burned the weeds at an average cost of \$3.47 per mile, including all charges such as fuel, labor, rental, interest on the investment, depreciation, etc. The following reports cover the cost of operation of four burners during the season of 1925 on railroads in the Northwest.

A report of 1,814 miles burned in 111 days at the following cost:

Labor (operator, helper and section men following)	\$2,671.25
Fuel (distillate oil at 5.7 cents per gal.)	2,942.28
Gasoline and lubricating oil	333.77
Rental of equipment	333.00
	\$6,280.30

Average cost per mile	\$3.57
Average miles per day	17.2
Average fuel consumption per mile, gal.	28

A report of 449.5 miles burned in 30 days at the following cost:

Labor (operator and helper with no section men)	\$ 176.75
Fuel (distillate oil at 7 cents per gal.)	1,017.73
Gasoline and lubricating oil	45.87
Repairs	9.85
Rental of equipment	66.00
	\$1,316.20

Average cost per mile	\$2.93
Average miles per day	15
Average fuel consumption per mile, gal.	32

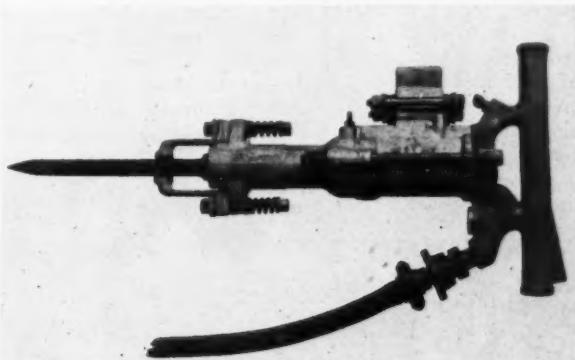
A report of 377 miles burned in 24 days at the following cost:

Labor (operator, helper and section men following)	\$ 700.48
Fuel (distillate oil 9,799 gal.)	645.08
Gasoline and lubricating oil	51.42
Repairs	38.94
Rental of tank car	124.00
Average cost per mile	\$4.13
Average miles per day	15
Average fuel consumption per mile	23.3

The Woolery burner is most effective on branch lines or on slow traffic lines where traffic interference is not excessive and where the revenue from such lines will not justify the cost of weed eradication by other means. However, the manufacturers feel that the low cost per mile with this machine makes its use attractive on any line.

#### Improved Concrete Breakers

TWO NEW concrete breakers of improved type have just been placed on the market by the Sullivan Machinery Company, Chicago. These are known as the DW-221 and the DP-221. The valve for these breakers is an improved modification of the pioneer Sullivan drill valve. Its outstanding characteristics are



The DW-221 Concrete Breaker

light weight, rapid action, positive control of the piston and hard blows.

The valve mechanism is secured in the chest by side rods which hold the valve buffers and the single leaf buffer springs in position. The valve buffers are round pieces of tool steel turned and heat-treated. The valve itself is made from alloy bar steel especially heat-treated to resist shock and breakage. A hood or deflector is provided as part of the valve chest to throw the exhaust from the drill away from the operator.

The piston is made from bar stock of special alloy steel, ground after heat treatment to a close running

fit in the cylinder. The forward end has a button turned on it, which lessens the possibility of upsetting and binding in the bushing if operated on poor shanks. The striking end is guided in a long bearing, which is a part of the cylinder.

The cylinder is a solid drop forging, machined, hardened and ground to size. The valve chest is not separate, but is a part of the forging. The bore of the chest is ground accurately and holds the valve chest bushings in which the spool valve reciprocates, so that in case of wear the bushing may be renewed without having to replace the cylinder. A dustproof chuck housing made from a solid drop forging bored out, hardened and ground incloses the chuck and chuck bushing. Lubrication of front end parts is accomplished by a tapped opening closed by a thumb plug.

The back head has an oil boss on top of the seat for the throttle valve. Oil can be poured into this chamber, which leads to the main inlet port. This carries oil through the working parts of the drill. A separate oil reservoir in the side of the cylinder provides an automatic oil feed through the main inlet port.

The DP-221 concrete breaker is a lighter type, fast-running tool, weighing but 41½ lb., while the DW-221 is a heavy-duty breaker, weighing 75 lb.

### Concrete Cribbing Erection Requires Only a Small Force

THE GRADE separation work of the Grand Trunk was carried on for the past 18 months in Detroit, Mich., required a large amount of retaining wall construction to hold back the earth in cuts and also retain fills carrying the tracks. These conditions made a cribbing wall the logical type of construction, for since a cribbing wall could be set on solid ground, allowing the flexibility of the construction to care for any inequalities in settlement that might arise, a considerable amount of excavation was saved. There was also a saving in the cost of the wall itself. In addition, a cribbing wall could be installed much more rapidly and put into service more quickly; with a saving of money, labor and time.

The type of cribbing to be used had to meet several requirements. For appearance sake a closed face type of wall was desired. To realize the full economies in erection it was necessary to use a simple unit. It was also necessary that the unit used would permit the easy forming of various angles and returns in the wall.

A consideration of these requirements led to the selection of "Anchor" cribbing made by the Federal Cement

Tile Company, Chicago. The nature of this cribbing construction which was described in *Railway Engineering and Maintenance* for November, 1925, page 468, is readily seen in the photographs.

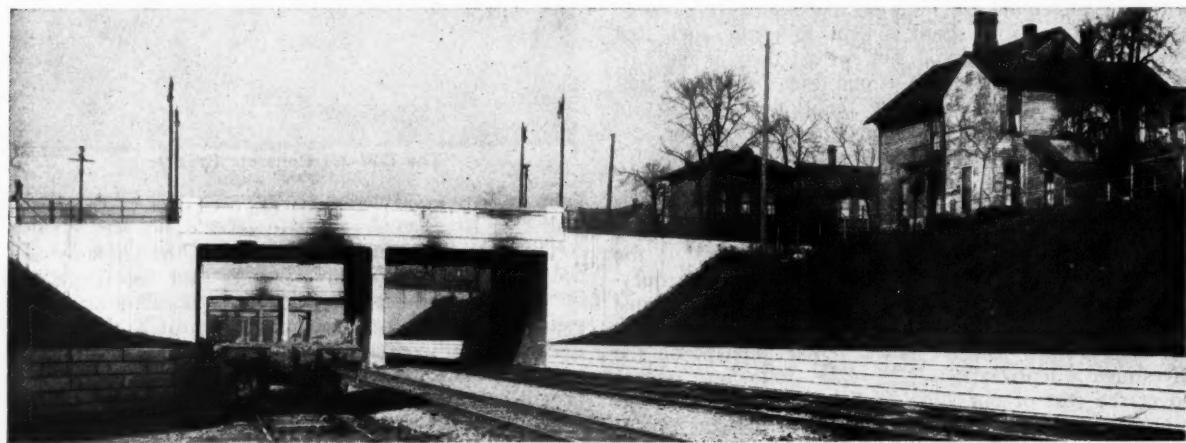
The Dequindre grade separation required about 14,000 sq. ft. of wall. On this work the cribbing members were shipped in box cars. The unloading and handling to storage piles was done by hand. The members were slid



**How the Wall is Erected by Hand.**

down a plank and picked up by men who carried the members to a storage pile. The erection was also done by hand, but this work was supplemented in the section that was eight feet high by the use of a steam shovel. This was used by attaching a chain to the dipper arm and using it to raise the members. This speeded up the work on the higher sections. The handling of the headers or anchor members required six men on the average and the stretchers or face members four men.

The West Detroit grade separation involved about 41,000 sq. ft. of wall, and advantage was taken of the experience gained on the prior Dequindre work. On the West Detroit work, cribbing was shipped in gondola cars. A locomotive crane with a 40-ft. boom was used to pick the members from the cars and place them in the wall direct without storage. This work required an average of four to six men, divided between the car and the



**The Anchor Wall Presents a Smooth, Finished Appearance.**

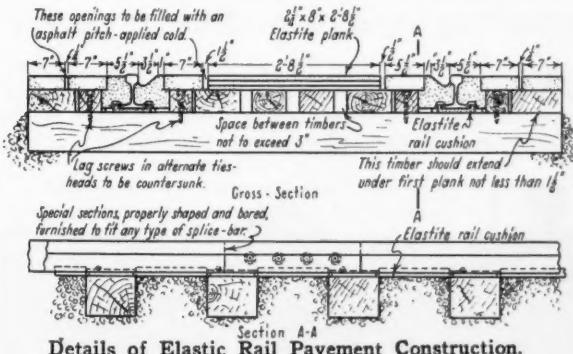
erection. This method of handling speeded up the work and with a smaller crew than on the Dequindre work the amount of wall laid per day was almost trebled, running 800 to 900 sq. ft. per day.

An interesting comparison of costs may be drawn from the erection of about 1,500 sq. ft. of cribbing wall in four wing walls at a bridge in Romeo, Mich. This was handled similarly to the West Detroit work. The members were unloaded with the boom crane and then had to be hauled 1,000 ft. in wagons and unloaded. The crane was again used in placing the members. On this work the unloading and hauling of 1,500 sq. ft. of wall cost \$90, including one day crane rental at \$35. The excavation and placing cost 27 cents per square foot, which included the use of the crane at the same rate. This cost also included the cost of pumping the coffer dam dry to permit laying. This work was done in the late fall after cold weather had set in, which of course affected the erection cost to a certain extent.

In summary, the cost of handling, particularly unloading, is greatly reduced by the use of a rapid moving mechanical hoist. Where speed is a prime factor, the use of a crane is advantageous. If the work is spread over a long section so that several gangs can work to advantage, this type of wall can be handled to good advantage by hand. In small jobs, of course, there is not as great economy in mechanical equipment; but where there is a crane not in use on the job, this type of cribbing can be built into a wall very rapidly.

## A New Form of Highway Crossing Construction

THE RESULTS obtained with the use of Elastite rail filler, a bitumen product designed to form a flangeway and the junction between track rails and pavements in highway crossings, has led the manufacturers of this material, the Philip Carey Company, Cincinnati, Ohio, to develop a complete track pavement of the same material. It is made of an asphaltic composition reinforced with saturated rag fibers and with only a small percentage of mineral matter. This



Details of Elastic Rail Pavement Construction.

material is compressed to form units of various sizes and shapes having high tenacity and the property of knitting or healing under traffic.

The crossing construction consists of pre-formed rail filler sections, each adapted to bond with pre-formed pavement slabs approximately two inches in thickness, the pavement slabs being supported on wooden stringers running longitudinally with the track and resting on the ties. The rail filler sections are furnished in three-foot lengths with special sections to carry the construction around rail joints. The section placed on the inside of the rail is shaped to give an ample flangeway and has a shoulder capable of

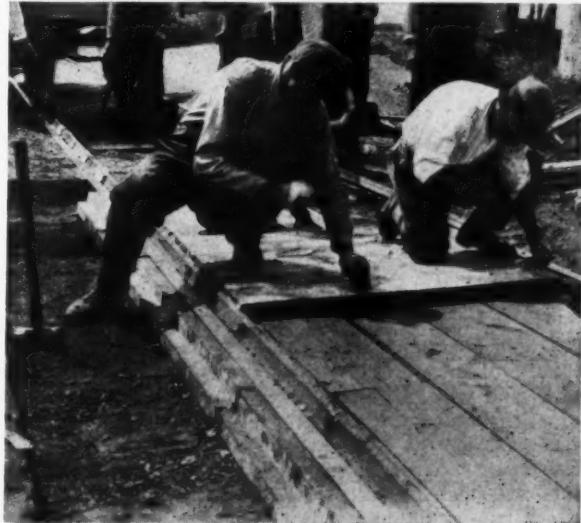
withstanding vehicular traffic. The section outside the rail is of sufficient width to prevent the false flanges on wheels from coming in contact with the pavement. Between this unit and the end of the ties the pavement is formed by longitudinal slabs seven inches wide, a similar longitudinal unit being provided adjacent to the rail filler on the inside. The remaining space of 2 ft. 8½ in. between the rails is paved



An Elastite Highway Crossing Installed at Low Temperatures in Cincinnati, Ohio.

by means of units placed transversely on wooden stringers spanning the ties. These transverse units are provided with longitudinal joints somewhat similar to that provided in ship lap lumber. All of these pavement units are spiked to the supporting timbers the same as lumber. Filling of open joints with a special asphalt pitch completes the job.

The manufacturers of elastite track pavement point to a number of advantages for this construction, of which the most notable is that it affords the advantages of bitumen crossing construction as regards durability, surface and water tightness, while possessing the advantage of plank crossings in that it may be removed readily for access to the track. Having the characteristics of lumber as regards shape and manner



How the Crossing Is Installed.

of application no difficulty has been experienced in getting the track forces to install these crossings properly. It is also said that this construction may be applied as readily in cold weather as in extremely hot weather.

Another property to which the manufacturer calls attention is that of insulating the rails effectively. This is the particular function of the elastite rail cushion shown in the drawing, a slab section which is placed under the rail between ties to separate the rail from the ballast.

### Earth Cushions the Blow Received by This Bumping Post

**A**BUMPING post of moderate cost that is designed to yield before the blow delivered by rapidly moving cars rather than to present a rigid obstruction, has been developed by the Louisville Frog & Switch Company, Louisville, Ky. As seen in the first illustration a cast-steel bumper is mounted on an A-frame made of steel angles that rest on three short timbers placed in a slightly inclined position at the rear of the post. From the top and bottom of this A-frame, tension members made of three-inch steel bars extend forward and downward outside the rails where, with other steel members, they are arranged to form a steel basket buried under the track, which effectively encloses a mass of earth 5 1/3 ft. wide by 44 in. deep. All members of this basket are of structural steel bars except two, which are placed in a substantially vertical position and are provided with

of an excessive blow so that the entire bumping post structure may move without injury.

In installing a post of this type the ground is cleared for a distance of nine feet at the end of the track, the rails and ties are removed and a hole excavated 44 in. deep by 22 in. wide lengthwise of the track to receive the anchor structure of the post. But the bumping post



This Post was Pushed Back 14 in. by a Severe Blow. It was Displaced but Not Injured.



A Skeleton View of the Bumping Post Complete.

hooks at the top which engage the outside flanges of the rail. These two members are made of cast steel.

The impact delivered against the post is resisted by the bearing of the transverse members of this basket on the earth and which, as seen in the illustration, are curved so as to transmit the earth resistance to the tension members with the least tendency toward distortion. The resistance which the post presents to the impact is therefore dependent on the resistance offered by the earth, which has been found sufficient to stop a car moving at ordinary service speeds without perceptible movement, but not enough to stop a blow of unusual severity without some movement. In fact, in one test the entire post structure was moved back 14 in., a large crevice being formed in the ground ahead of the anchor members. The base of the A-frame supporting the bumper casting is left free to slide on the inclined timbers in the event

is delivered all in one piece (it weighs approximately 800 lb.) and is set in place as a unit. One tie is cut to fit between the side members to act as a strut and after this has been set in place the ground is packed into the hole, the ties are relaid and the rails restored to place, taking care to have the hooks of the two cast steel members engage the outside flanges of the rails. The ground behind the post is banked up to give an inclined support for the timbers supporting the foot of the A-frame. Bumping posts of this type are said to have withstood four years' service without injury.

### Blue Flag Signal Is Attached to the Rail

**A**PORTABLE blue flag signal that is securely attached to the rail by a swing of the arm and as readily removed has been placed on the market by the Louisville Frog & Switch Company, Louisville, Ky. It



The Blue Flag Signal.

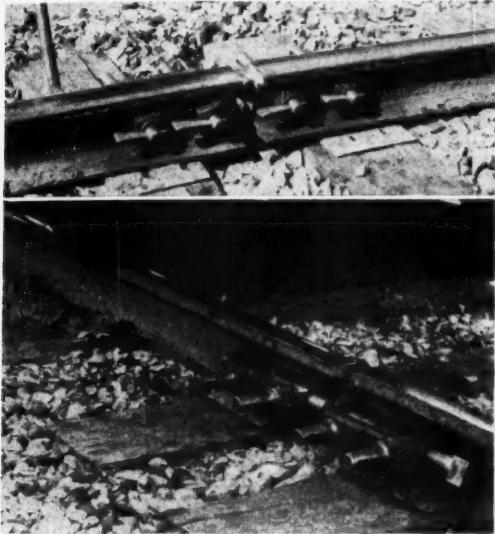
consists of a sheet metal disc attached to a staff made of a 1 1/4-in. by 1 1/4-in. angle iron, at the lower end of

which is fastened a curved spring designed to take a grip on the ball of the rail. When in position the staff hangs at an angle of approximately 45 deg., thereby bringing the disc almost to the center of the track at about the height of a drawbar above the ground. The weight of the signal complete is only 10 lb.

As normally painted the disc is blue and the staff black. If desired the purchaser may have the signal furnished with lettering on the target to suit the standards of the road.

### A New Expansion Adjuster

**A**N EXPANSION adjuster has been designed by A. V. M. Loker, yard foreman on the Southern Pacific at Tracy, Cal., which will allow the expansion of the rail joint to be adjusted by two men, one to loosen the bolts and tighten them and the other to handle the device.



Two Views of the Adjuster in Use. When no Train is to be Passed Nuts May be Slipped Over the Pins in Place of the Fish Plate.

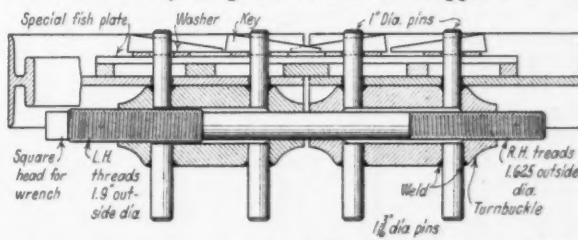
There is also a long bar that is threaded at each end to engage the turn buckles. The turn buckles are threaded only at one end, one of them having left hand threads, 1.9 in. outside diameter, and the other right hand threads 1.625 in. outside diameter. The other end of each turn This new adjuster weighs only 80 lb. and can be handled easily by one man. In addition to the advantage of its limited weight, it has a further advantage in that it can be used under traffic. It is not necessary to remove the adjuster when trains approach or pass. In a recent test a 99-car freight train was run over a track with an adjuster in place on one of the joints with entire safety.

The adjuster consists of two turn buckles with special threading, each of which is provided on each side with machine steel pins to fit into the bolt holes of the rail. buckle has plain holes  $1 \frac{21}{32}$  in. diameter. The bar has threads at the end corresponding with the threading of the turn buckles and a square head at the end with a larger diameter threading, while the shank and the threads at the smaller end are small enough to slip through the turn buckle with the left hand threading to permit it to be screwed into the other turn buckle.

The turn buckles have bolt hole pins on both sides, those on one side being 1 in. in diameter, while those on the other side are  $1 \frac{3}{16}$  in. diameter so that the device may readily be used for joints having two sizes of bolts.

These pins are slotted near the ends so that when the joint bars have been removed from the joints and the pins are thrust through the bolt holes, special fish plates with slotted holes may be placed against the rail on the far side of the joints and held in place by keys driven into the slots. It is, however, unnecessary to drive these keys home unless it is found necessary to pass a train over the track while the adjuster is in place.

After the adjusting device has been applied to the



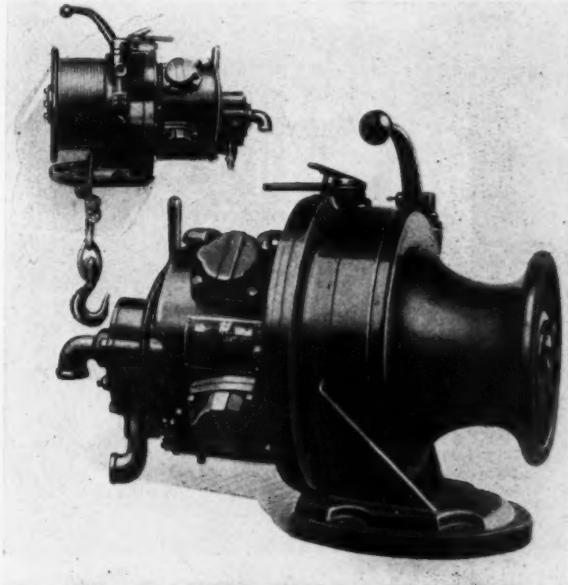
A Horizontal Section of the Adjuster in Place on a Joint.

joints a special wrench is placed on the square head on the threaded bar and turned one way or the other to draw the rails together or to force them apart. Tests have shown that five rails may be pulled by the adjuster at one setting without any indication of over stress in the adjuster.

In addition to its use in distributing expansion in track, this device has been found of value for opening a joint to apply the end post in an insulated joint. Its use makes it unnecessary to have a track gang drive back the rail for the signal maintainer when this work is being done.

### A New Portable Air Hoist

**A** NEW air motor hoist has been developed by the Ingersoll-Rand Company, New York, known as its size DU "Utility" hoist. The hoist has been especially designed for use with portable compressors and



The DU Utility Hoist.

is suitable for a wide variety of work. In bridge or building construction and repairs it may be used for hoisting such building material as steel members, building stone, concrete forms, and concrete. It may

even be used for hauling the compressor itself a short distance.

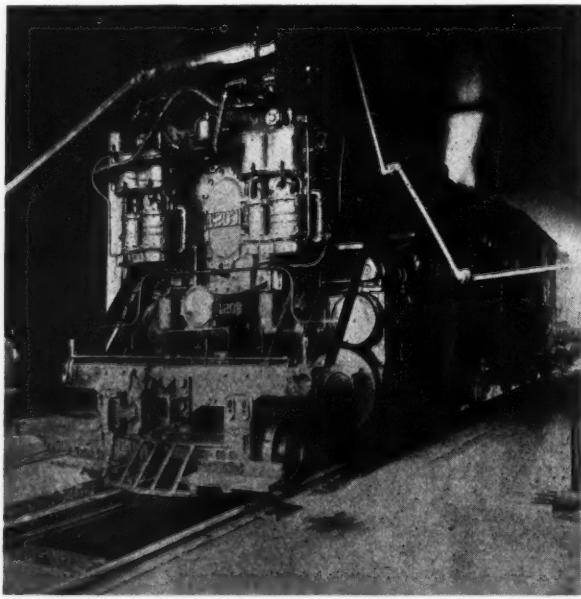
It is a light, compact hoist of the winch type. It is provided with mountings by which it may be attached to the rear end of a 5½-in. by 5-in. or a 5-in. by 5-in. portable compressor, to the side of the larger compressors, or to compressors mounted on trucks. In such cases it is always ready for use and adds little to the overall dimensions and weight of the compressor. A swivel bolt through the bottom of the base permits the hoist to be swung around into any desired position.

The "Utility" hoist is said to be economical in air consumption. A winch head can be furnished in place of the rope drum. It has a lifting capacity of 1,000 lb. The rope speed is 61 ft. per min. under maximum load at 80 lb. air pressure. The drum will take 350 ft. of 5/16-in. diameter rope. The hoist complete is 15 in. wide, 25¾ in. long and 19½ in. high and weighs 250 lb.

The hoist is equipped with a clutch so that the cable can be easily played out by hand or by a down grade load without turning over the motor and consuming air. A hand brake on the drum is provided to check the unwinding and stop it in any desired position. The throttle control permits of a variation in the speed of rope travel from the very slightest movement up to the maximum speed.

### Railroads Find Quick Hardening Cement of Material Advantage

**R**AILWAY bridge and building forces are constantly confronted with the problem of carrying on construction work with a minimum of interference with traffic and where concrete work is required, are often compelled to resort to pre-cast construction or elaborate falsework to avoid traffic delays during the



A Locomotive Was Run Over This Engine Pit 48 Hours After the New Concrete Was Placed.

time that the concrete is developing adequate strength to carry normal working loads. This is not infrequently led to expedients which give rise to less satisfactory structures than could have been obtained if monolithic construction were possible. In some cases

the delays have been inevitable. For this reason railway engineers have been quick to find uses for Atlas lumnite cement to meet their special problems because of its property of developing as much strength in concrete in 24 hours as Portland cement concrete will have in 28 days.

For example, the Chesapeake & Ohio recently found it necessary to rebuild one of the pits in a roundhouse where the service demand on the pit was such as to require it to be restored to service as quickly as possible. It was possible to utilize a portion of the old walls, which were built of Portland cement concrete, but the upper part had to be replaced. Lumnite cement was used in the new concrete in the proportions of 1:2:4, the coarse aggregate being 1½-in. crushed stone. Twenty-four hours after the concrete was placed a locomotive weighing 577,100 lb. was run into the stall over this pit. An examination of the new concrete showed that a good job had been obtained and that the new lumnite cement concrete had bonded thoroughly with the old Portland cement concrete.

Another illustration is afforded by the renewal of a turntable on the Southern at Asheville, N. C., requiring the construction of a new bearing on the center pier to receive a new center. Concrete made with lumnite cement was placed on Sunday and the turntable was restored to service on the following Tuesday.

Atlas lumnite cement is not a quick-setting cement. It reaches its initial set in from 4 to 6 hours, thus allowing ample time for mixing, placing and finishing, but after the initial set it hardens rapidly. Compression tests on 6-in. by 12-in. cylinders with 1:2:4 concrete gave a strength of 2,865 lb. per sq. in. in 24 hours and 3,351 lb. per sq. in. in 48 hours. The fineness modulus for the fine aggregate in this concrete was 2.97 and for the coarse aggregate 6.73. The mixture had a consistency which gave a slump of seven inches.

One of the advantages of this material for which the manufacturers make a particular claim is that less protection is required when placing lumnite cement concrete at low temperatures. This is due to the fact that the chemical action of hardening develops considerable heat so that no protection is necessary after 24 hours. Thus the Delaware, Lackawanna & Western built a reinforced concrete bridge slab 12 in. thick at a temperature of 20 deg. F., which dropped to 18 deg. F. during the following night. The concrete was protected for 24 hours, after which the bridge was placed in service with a saving of three weeks.

### An Electric Motor Car and Power Plant

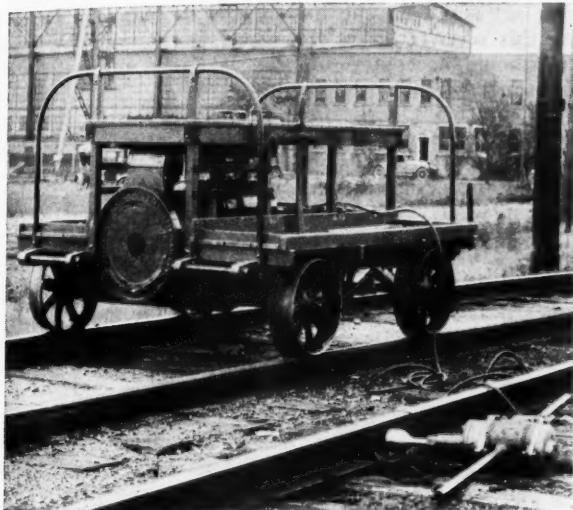
**T**HE increasing demand for power tools in maintenance of way and structures work on railroads has resulted in the recent development of a motor car which is virtually a portable electric power plant designed specifically with a view to the problems of this department in operating electric tools where power is not readily accessible. This car which is the outcome of experiments with an improvised power plant on the Baltimore and Ohio, where the practicability of a combined motor car and power plant for signal and maintenance work was clearly demonstrated. It comprises essentially a typical center load motor car, equipped with an 8 h.p. air-cooled gasoline engine, which is direct-connected to an electric generator and motor. The generator furnishes alternating or direct current of 110 volts while the motor drives the car, the transmission being obtained by a chain running from the motor to the drive axle of the car.

The generator develops sufficient electricity to operate six to eight electric tie tampers, or electric bonding drills, and it is also adapted to operate electric rail saws, electric boring tools, bolt tighteners, chipping hammers, scaling hammers or cleaners, electric air compressors used for cleaning and spray painting bridges, electric

Car, as this unit is termed, is manufactured by the Euclid Electrical Manufacturing Company, Euclid, Ohio, with E. J. Correll, Railway Exchange Bldg., Chicago, distributor.

### Woolery Applies Engine to the Three-Man Rail Layer

THE continued use of the Three-Man Rail Layer has led occasionally to the development of home-made applications of small gas engines for the purpose of converting this device into a power-operated machine. This expedient has now been placed on a commercial basis by the Woolery Machine Company in the application of its model C engine to the portable rail derrick with attachments designed to effect a combination of these two pieces of equipment on a practical basis. The engine is mounted on a cantilever bracket attached to the rear of the derrick frame with a friction drive geared to the chain-winding shaft of the derrick. Operation is controlled entirely by a single lever. The load is lifted by pressing down on this lever, which has the effect of pressing a friction drum against the pulley on the engine shaft, which is made of friction paper. Lifting up on the lever a few inches releases the power and applies a brake. It is necessary to put downward pressure on the hand lever to raise a load, but if the operator lets go the lever when the load has been lifted

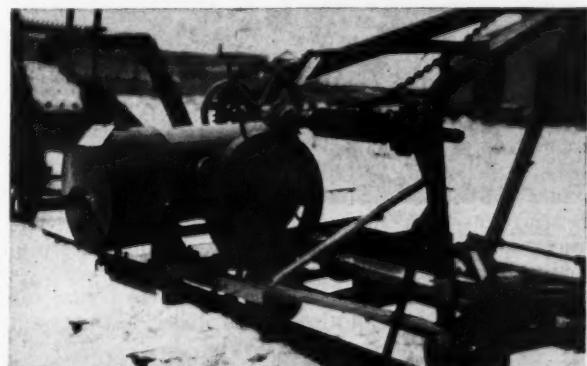


The Universal Power Car Operating a Bolt Tightener.

hammers, chisels, flood light systems for night work, etc. As a power plant, its distinctive features lie in its adaptability for operating any type of electrical tool on the market and its capability of operating one or more varieties of tools at the same time. Thus, it is capable of operating bolt tighteners while furnishing electricity for any variety of electrical tie tamper.

The car is also distinctive for its serviceability as a motor car since it can be operated at a speed of 25 miles per hour with a load of six men, tools and a loaded trailer. A unique feature of the car from this standpoint is the fact that it is electrically driven. The car while under motion is operated through an electrical controller, similar to a controller on a street car, an advantage of this being in the perfection of control afforded at various speeds. The total plant weighs about 1,300 lb. and it can be removed from the track by six men.

The car is built with an all steel frame and is equipped with 16-in. wheels with four-wheel brakes while ball-bearings have been provided wherever possible to reduce friction during motion of the car. The Universal Power



How the Engine is Mounted on the Three-Man Rail Layer.

to the desired height the brake automatically applies itself.

It is said that this outfit increases the work of the machine in the following respects: It lifts the rail from the position where it has been unloaded much more



Tamping Track With the Universal Power Car.

quickly than can be done by hand and it can also be lowered to position more quickly by means of the brake which gives the operator effective control of the rail while being lowered. The chain can be pulled out rapidly

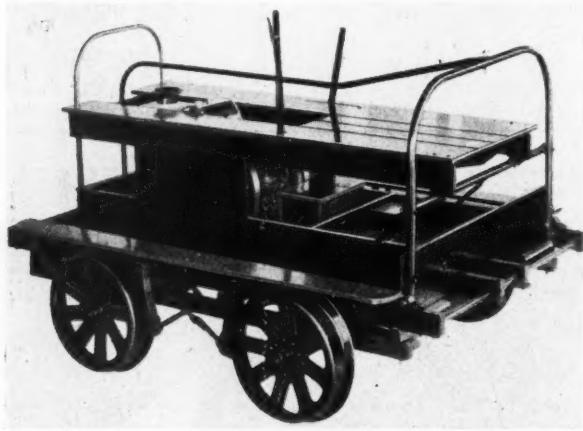


Portable Rail Layer in Operation with a Woolery Engine.

preparatory to hitching on the next rail without the danger incident to the use of the rapidly revolving hand crank and when sufficient chain has been unreeled the drum can be stopped abruptly by the brake. The engine attachment is of advantage when handling heavy rail.

### Standardizing Motor Car Equipment

THE ballbearing, free-running, two-speed engine introduced last year by Fairmont Railway Motors, Inc., Fairmont, Minn., on its Advance series cars is now applied to all section cars manufactured by that company. Several improvements have also been incorporated in this engine which reduce wear and make for low maintenance cost. The crank pin bearing has been increased in size 45 per cent. The ways upon which this free-running engine slides into action are now  $2\frac{1}{2}$  times as large as before and are fitted with an automatic spring pick-up to insure the correct tension at all times regardless of the wear. A shock absorber on the lever link prevents transmission of any vibration to the lever, thereby increasing its life while reducing wear on the entire car.



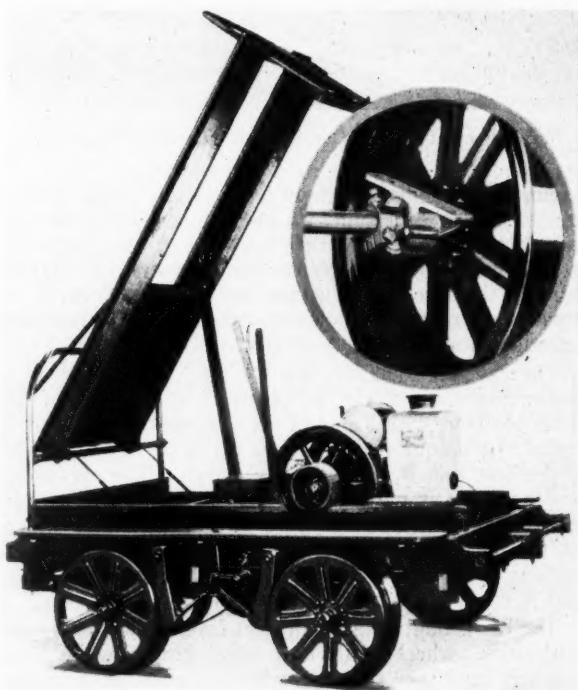
The M-2 Section Motor Car

The engine now has a simple timer with only two wearing parts, the cam and the contact spring. These can be renewed for less than 45 cents and it is said that the change can be made in less than two minutes

without taking off the fly wheel or disturbing any part of the engine.

Another feature of this engine is the manner in which the fly wheels are secured to the engine shaft. Each fly wheel is applied with a straight fit and is held on by a patented Whitney half moon key which slides into a crevice in the shaft under the pressure of a set screw in the hub of the fly wheel. Turning this screw releases the wheel, no hammer or key drift being necessary. It can be taken off with an eight-inch wrench.

All Fairmont cars are now equipped with Bower axle bearings. These bearings have inner and outer sleeves which take both radial and thrust loads, thereby protecting the axle wheel and axle box casing against wear. The inner sleeve or bearing (1) of hardened steel fits tight on the axle and turns with the axle. The outer sleeve (2) is also of hardened steel. All loading and propelling thrust are on this inner bearing and not on the axle. The flanges (3) on the inner side of each roller bearing absorb lateral thrusts of the car, thus eliminating wear on the wheel



Hinged Housing Seats Facilitate Cleaning, Axle Bearing Shown in the Insert

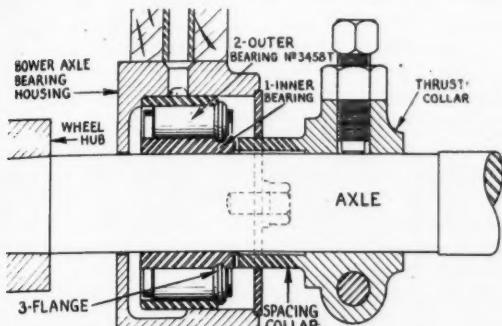
hub. An adjustable thrust collar sets snug on the inner bearing and therefore wear on the axle box casing is avoided because the casing does not touch moving parts of the axle or wheel at any point.

To give ready access to the engine the bodies of all cars are now readily removed by taking out four bolts, one at each corner. On the A-2 and M-2 cars facility for ready maintenance is further amplified by hinging the housing seats so that they may be swung up out of the way when cleaning the engine. All cars are now equipped with a center rail type of safety railing, arched front and rear and with a guard to keep tools from falling off the car.

In addition to the general changes outlined above certain improvements have been developed on cars of particular series. For example, the transmission

of the A-2 series section car has been changed from a belt and chain drive to a belt and gear drive, tests having demonstrated that the enclosed gear transmission offers greater economy. The gears run in an oil bath and are kept free from dirt and grime, requiring a change of oil only once a year.

It is also of interest that this company has adopted



Details of the Bower Axle Bearing

the practice of placing a "Safety First" plate on all cars leaving the factory, this plate being stamped from heavy gage brass sheets with the raised letters "Safety First" showing red against a blue background, the function of which is to serve as a constant reminder to operators of the car not only to be on the lookout for trains while operating the car but to take adequate precautions when dismounting the car and unloading tools.

## A Non-Poisonous Weed Killer Now Available

THE KILLING of weeds on track by means of chemicals has become a thoroughly established practice on many miles of railroad in the United States and Canada with the result that good appearance, clean ballast and better drainage have been obtained with a pronounced saving in track labor. The use of chemicals for this purpose has increased from year to year as the economy of this practice has become established, notwithstanding one inherent disadvantage, the fact that the chemical commonly used, a solution of sodium arsenite, is poisonous to animals as well as plant life, leading to frequent claims for the death of stock in spite of the precautions taken to prevent cattle, horses and other animals from getting on the right-of-way.

While the use of arsenic as a weed killer has grown steadily in the face of this difficulty because it has proved a measure of economy, even with adequate allowance for stock claims, there has been a definite demand for a non-poisonous weed killer, especially by railway lines traversing grazing or dairy farming areas. To meet this demand the Chipman Chemical Engineering Company, Bound Brook, N. J., has developed a practical, non-poisonous weed killer after a protracted period of experimentation. This development is founded on a Swiss patent for which the Chipman Company is exclusive licensee in North and South America. However, experiments conducted on a practical basis in this country have resulted in some marked changes in the formula for which the company has made application for United States patents.

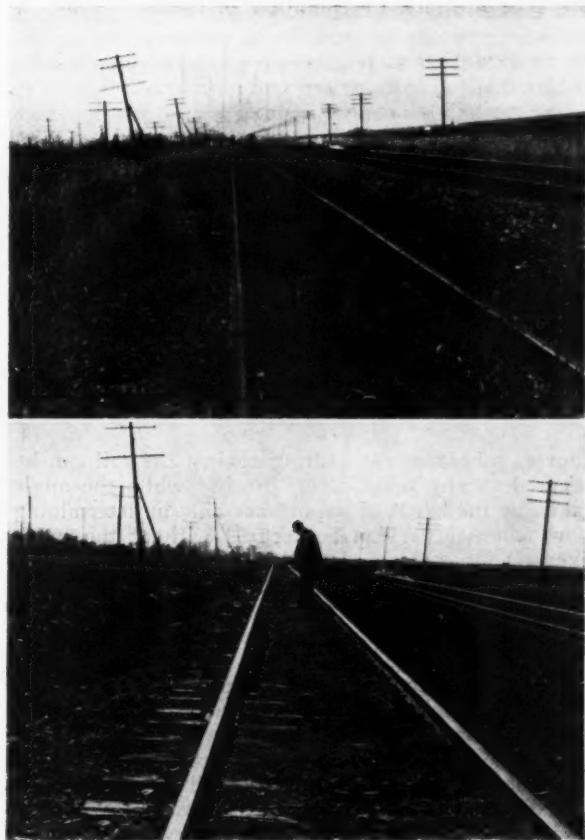
The action of this chemical on plant life is essentially one of suffocation which stops the respiratory and transpiratory functions of the chlorophyll or life giving substances of the plant. At first no effect is apparent but

in a few days the leaves begin to turn yellow, after which both tops and roots die rapidly.

The characteristics of this material is indicated by the following statement given out by the manufacturer:

Specific gravity.....	1.480
Weight .....	12.35 lb. per U. S. gallon
Analyzing chloric acid.....	3.0 lb. per U. S. gallon
Calcium chloride.....	2.5 lb. per U. S. gallon
Available nascent oxygen.....	1.7 lb. per U. S. gallon

Before placing this material on the market the manufacturer instituted a practical test on 2,500 miles of railroad covering a wide variety of climatic and weed conditions in various parts of the United States. It was not until after the results of this test had been thoroughly established that the Chipman Company has undertaken to promote the general use of this material. One result of the test for which the manufacturer makes particular claim is that the "NP" weed killer effectively kills Johnson grass, Bermuda grass



Views of the Same Piece of Track Before and After Treatment.

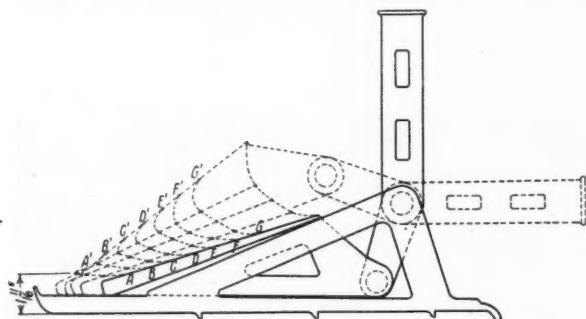
and horse tail, three species of weeds which have been particularly resistant to destruction by chemicals.

"NP" is used exactly the same way as other weed killers, being applied by the usual spraying equipment. Normally the solution is delivered in tank cars and is diluted for application with 10 times the volume of water. The cost of "NP" is somewhat higher than that of arsenic on the basis of the present quotations for the later material. It does not follow, however, that the cost of application for comparable results will be higher than for arsenic treatment in all cases, as shown by a comparison of the costs of chemical treatment on two parallel lines of railroad traversing 200

miles of territory where climatic conditions are substantially the same, and the predominating weed growth is Johnson grass. Heretofore it has been necessary to make two heavy applications of chemical each season to keep the weeds under control. During the past season one line was treated with arsenic and the other with "Atlas NP" and the effect of the latter was such that the cost of treatment was about \$2,000 less than that on the same mileage on the other line.

### A New Track Liner

**I**NVARIABLY when the question arises of developing a more economical and effective means of lining track, it has been recognized that the lining bar has, aside from its simplicity, one feature of outstanding importance in its favor, namely, the facility with which it can be fitted to the rail. There is seldom any cribbing or blocking or special skill required to bring it immediately in contact with the rail, regardless of the type of track or condition of ballast. This, of



An Action Diagram of the Taylor Track Liner Showing the Position of the Shoe Throughout the Various Movements of the Lever.

course, is because the bearing against the rail can be secured at any point along the bar while the angle taken by the bar is of importance only in determining how much thrust can be secured without too much exertion for excessive lifting of the track.

That it is possible to improve on the lining bar without losing this characteristic, however, is suggested by the latest device which has been developed for track lining purposes, a distinguishing feature of which lies in the method by which the thrust is imparted to the rail. This is accomplished by an inclined shoe, one end of which is connected to the operating lever while the other is free to slide forward on a base casting. The shoe has a long straight slope, which similarly to the common lining bar, will engage the rail base at any point on its surface.

The entire device, which consists of the base, the shoe and the jacking arm, is so designed as to fit snugly against the rail base in various kinds of ballast, and the liner base is purposely made long to afford adequate bearing in soft ballast as well as to dispense with the necessity of cribbing or blocking when fitting the liner to the track. Lugs on the bottom provide additional precaution against slipping and the open construction of the base as well as all surfaces are a protection against any clogging from the ballast.

The power arm is designed to receive an ordinary lining bar as a lever which does away with the necessity of special tools to operate the lining and as the diagram shows the lever is designed so that the operation of lining is one of pulling the level downward rather than that of pulling upward as was necessary with the

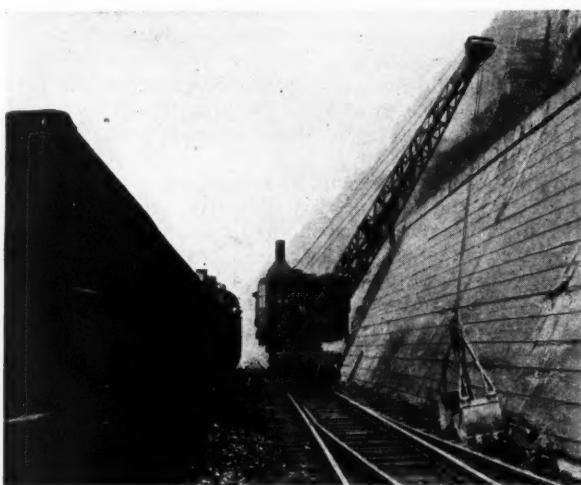
lining bar. As the diagram further shows, there is practically no lifting action of the liner throughout the full stroke of the lever whenever the thrust against the rail is applied within the lower quarter of the shoe. The dotted line shows the position of the shoe as it is forced outward. With this liner which is of cast steel construction throughout and weighs 29.5 the effort has been to provide a tool that not only embodies the good points of the lining bar but one that will afford an adequate pushing movement for ordinary lining work without repeated shifting of the fulcrum or lever arm. It is also a safe tool for workman and a liner that occupies a position well in the clear of all trains operating over the track.

In a recent test on a heavy traffic line with dirty rock ballast where 18 men with lining bars had tried and failed to throw the track, three liners of the type described are reported to have moved the track successfully and to have otherwise given a satisfactory account of themselves in the saving of men and time. The Taylor Track Liner is a patent of William Taylor, Lorain, Ohio, and is being distributed by E. J. Correll, Railway Exchange Bldg., Chicago.

### A Crane That Simplifies Control

**A**N accessory which promotes safety and widens the range of activity of locomotive cranes working on tracks adjacent to main track has been developed by the McMyler-Interstate Company, Cleveland Ohio, and is embodied in what is known as its Bobtail Crane. The device consists of an adjustable stop, mounted on the car body, which controls the amount of swing and permits operation on tracks adjacent to through traffic without danger of fouling such traffic. The rear end of the turntable and cab have been designed so that it is possible to swing through an angle of 19 deg. before the turntable overhangs the car body. This gives a working range of 11 ft. 3 in. at a radius of 35 ft., which is ample for all ditching operations.

Two of these machines recently demonstrated their usefulness in the removal of a bad slide on a large eastern railroad. The slide consisted of dirt, shale and

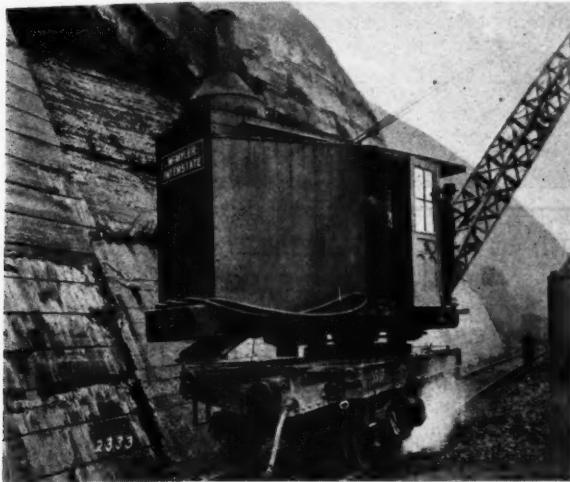


The No. 2 Bobtail Crane With Adjustable Stop.

rock which had a tendency to slide further where the toe of the bank was removed. This tendency precluded the use of steam shovels at the worst parts of the slides, and made the use of locomotive cranes particularly de-

sirable on account of their ability to remove material from the upper part of the slide, thus relieving the tendency to further sliding.

After the roadbed was cleared and ditched the tracks were re-ballasted by picking up the ballast between the tracks and screening it through a screen mounted on a



Rear View of the Crane Showing the Housing Drawn in to Avoid Fouling Adjacent Tracks.

gondola car, the dirt and ashes falling into the car while the clean ballast passed through a chute to the excavated space between the tracks. Equipped with a  $\frac{3}{4}$ -yd. bucket on a 30-ft. boom, each Bobtail crane cleaned about 1,000 ft. of track per day. The work was performed on a track adjacent to one on which trains were operated. The cranes were operated with speed and safety, since the stops prevented their swinging to an extent that would interfere with passing trains which were permitted to run past the cranes without slow orders.

### Fir Gutters for Railroad Buildings

**GUTTERS** of wood, or "dugouts" were widely used in the early period of American building activities, to be supplanted later by gutters of various metals. With the introduction of the Improved O. G. Fir Gutter, manufactured by E. M. Long & Sons, Cadiz, Ohio, the wood gutter is again being used ex-



An Atlantic Coast Line Station Equipped With Fir Gutters.

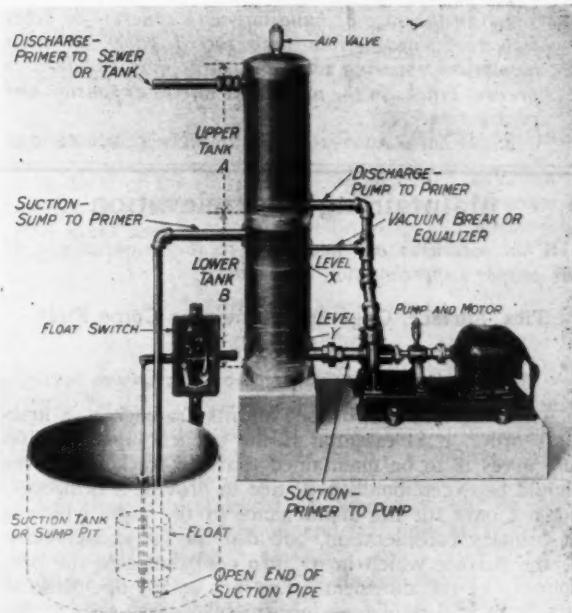
tensively, both on account of its durable qualities and its appearance. The resistance of the fir from which these gutters are made to deterioration from the weather or from smoke and fumes renders them adapt-

able to any type of roof for railroad or other buildings.

An interesting indication of the durability of these gutters is shown in the accompanying illustration of a modern passenger station of permanent construction built by the Atlantic Coast Line at Haines City, Fla., on which these gutters have been installed on a tile roof. In this installation it will also be noted that the gutters are set level, thereby blending in with the architectural treatment of the cornice and enhancing the appearance of the structure. Experience has demonstrated that the level gutter will carry off the water satisfactorily, while it retains straight, horizontal lines in keeping with the architectural design.

### An Automatic Primer for Pumps

**A**UTOMATIC primers for centrifugal pumps invite attention for the means they offer of encouraging the use of such pumps in places or under conditions where their economy and advantages are dependent upon the elimination of the attention required to keep them primed. It is in the effort to overcome this trouble that has resulted in the development of the Apco Primer, which is distinctive in



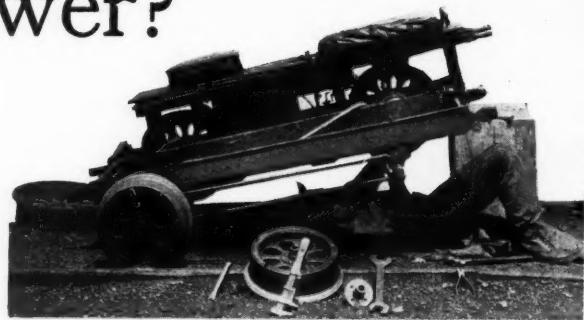
The Diagram Showing How the Pump Primer Is Installed.

having no moving or other parts requiring manual operation.

A typical installation is shown in the accompanying diagram. The lower tank "B" is filled with water to level "X." When the pump is started, it lowers the liquid to level "Y" and in so doing produces a vacuum in tank "B" into which air and water flow from the suction line and pump. As the water is removed from tank "B" by the pump, it is replaced by an equal quantity from the suction line. When pumping, tank "A" is filled with water. When the pump is stopped, the air valve at the top of tank "A" opens and allows the water in the tank to return by gravity through the pump to tank "B," forcing the air back through the suction, thus flushing the suction line and repriming the system. The primer is a product of the Automatic Primer Company, Chicago.

# What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities



## QUESTIONS TO BE ANSWERED IN THE APRIL ISSUE

1. Where river gravel consisting largely of water-worn pebbles is used as ballast, what can be done to improve the line-holding qualities of the ballast?
2. What is the smallest job of bridge renewal work on which it is economical to use portable air compressors and pneumatic tools?
3. When spacing ties, should the distance be measured from center to center of the ties, or should the space be fixed between the sides of the ties?
4. In the case of buildings with concrete or other slab roof construction with tarred paper or other membrane covering what measures may be taken to prevent cracks in the membrane due to expansion and contraction?
5. What measures should be taken to insure sani-

tary conditions in boarding cars and bunk houses for track forces? Should this be left to the division officers or should it be co-ordinated for the entire road?

6. What is the best way to clean out water tanks from the standpoints of cost, interruption to service, disposal and other factors?

7. In the operation of a ballast pit loading large quantities of ballast for various points on a railway, is it economical to assign an assistant trainmaster, or some similar officer, to direct the movements of the hauling crews?

8. Should bridge ties be renewed out of face or is it preferable to renew individual ties as they show signs of decay?

## Maintaining Superelevation

What measures are necessary to the maintenance of the proper superelevation on curves?

### Ties, Surface, Gage and Alinelement Come First

By F. LISTON

Canadian Pacific, Vaudreuil Station, Quebec

Assuming that the roadbed and its drainage is in first-class order, it is essential if the proper superelevation on curves is to be maintained that the track on curves should be exceptionally well tied to provide a firm bearing not only for the maintenance of the gage, which is of primary consideration, but also for the conservation of the surface which in its turn contributes to the permanence of the alinement. The lack of any one of these closely related requisites for superelevation leads to the demolition of the others.

That the maintenance of the gage is of primary consideration can be readily understood when we consider that although superelevation is an adjustment of the track for speed it must be adapted to the speed of all trains which pass over it with due regard for safety, comfort and economical track maintenance.

Movements at a speed much higher or much lower than the intended average lead to the crowding of the inside or the outside rail by the wheels and variations of gage creep in, especially during wet or wintry seasons. Therefore, constant gage testing should be maintained particularly in stretches of track without tie plates for the rail seats become slippery from water and ice, permitting the rails to slide and crowd the spikes out. In addition the spikes themselves become slippery from the same causes and pull or back out easier, thus subjecting them to the greatest strains when they are the least able to withstand the pressure.

Gage conditions are seriously affected by the amount of superelevation. The ill effects of excessive elevation are greater than those suffered when too little is used. The effect of excessive elevation is to throw more than the proper share of the load on to the low or inner rail thereby reducing the load on the outer rail correspondingly and inviting derailment. The excess weight crowds the low rail and turns it outward thereby spreading the gage. Too little elevation on the other hand permits the excess or unbalanced centrifugal force to cause pressure both horizontally and vertically against the outer rail increasing the flange wear.

These conditions can be readily detected by observing the rail wear, for a well-balanced curve is one on which the wear is almost the same on each rail. Thus, in experimenting with curve superelevation, when you find that the surface of the lower and higher rail can be kept up with the same amount of work and when you find the wear on both rails to be equalized, the gage giving no trouble and the riding conditions at different speeds approach the desired perfection, you will have found the suitable elevation and the curve should be maintained as near as possible with that superelevation. Non-uniformity of elevation has a most serious defect on the gage because cars will rock violently when rounding curves at high speed, throwing enormous strains on the rails and spikes at these points and resulting in the distortion of the gage, which if not corrected early, will result in the spreading of the track and the overturning of the rail.

The conservation of the surface, though not to be slighted on any portion of the track, should be maintained to the highest degree of perfection on curves because a variation of level, which would be quite indiscernible on tangents, is quite noticeable and in fact objectionable on curves. Depressions in the surface on curves when yet of a slight nature, are the cause of

a rolling movement in the equipment as it passes over them and if not readily eradicated grow into lurches which throw excessive strains on the rail and spikes, causing the rail to go out of line, spread or overturn and may cause an unevenly loaded car to rock off, not necessarily at the flat place but at a point ahead where the elevation becomes normal to the curve.

If the highest standard of maintenance is to be maintained on curves it is essential that the track level be used constantly, not only when surfacing to insure that the corrections are accurately made but also in the testing of the track for surface defects. It is not enough for a foreman to rely on his eye for there is a certain amount of shifting in the track, especially on curves, which cannot be detected in that way.

Surface defects like all other ills are found to strike at the weakest points, which in the case of the track are generally the joints. Although the solidity of the roadbed depends upon how well the surfacing ballast has been tamped in under the ties and how little the old ballast has been disturbed, yet if the joint itself is neglected the time spent in resurfacing is wasted. Looseness in the joints or in its fastenings is the cause of a low joint which in turn is the cause of loose ties which hang by their spikes, a condition which a foreman cannot always discover by sighting over the rail for the rail sometimes acts as would a strong spring, when the joints are not badly battered and recoils to its proper position after the passage of the loads. Defects such as this are certain to spoil good alinement and are the cause of a very uncomfortable riding track. This looseness can be generally detected by sounding the ties.

The third general measure essential to the maintenance of the proper superelevation on curves is the correctness of the alinement not only on the body of the curves but also on its spirals. Perfect alinement may be obtained through the string lining of the curve. Through this detailed method irregularities which the eye cannot sense as well on curves as it can on tangents are readily found. Detailed lining is a preventive of the "button-hook" formation which results from throwing the ends of the curve outside the line of the tangent. This distortion is generally brought about by lining the spirals out instead of in.

Every time a curve is worked on, no matter how little it may be, care should be taken to adjust the line, for although the proper amount of elevation has been determined for a given degree of curvature this elevation will not be correct if the degree of curvature is changed.

### Stopping Scour at a Culvert

*What measures may be taken to stop scouring beyond the downstream end of the culvert?*

#### It Depends on the Rate of Drainage and the Character of the Ground

By E. E. ADAMS

District Engineer, Great Northern, Spokane, Wash.

The first thing to be determined in connection with trouble of this kind is to ascertain whether the scouring is caused by the culvert flowing under head or whether the scouring is caused by the ordinary flow of water through the culvert. When the culvert actually flows under head the apron on the downstream end of the culvert should be extended and widened along the same angle lines of the usual short ordinary apron; the wing walls should also be extended so that the water and the force thereof may be spread over a greater area. Sometimes it may be necessary to provide the concrete

floor of the extended apron with baffles which tend to break the force and head of the water flowing through the culvert.

If the scour is caused from the ordinary flow of water it indicates the ground is unusually soft and in many cases this condition may be remedied by applying rip rap or angular rock extending for a short distance beyond the end of the culvert. If scour occurs at the lower end of small pipe culverts this trouble is usually overcome by placing rip rap.

The Great Northern has had considerable experience with scour at the downstream ends of some culverts and the remedial measures are usually consistent with the above.

### Rip Rap Will Usually Answer

By E. L. SINCLAIR

Assistant Engineer, Chicago, Milwaukee & St. Paul, Marion, Ia.

This is a difficult matter to handle and the most successful method I have found is to fill the hole that has been washed out with rip rap and pour cement grout over the rip rap to fill all of the space between the pieces of stone to prevent water from flowing down through it and undermining it. The rip rap can be thrown in and the only hand placing necessary is to leave the sides a little higher so as to form a channel for the water. It is, of course, necessary to stop the flow of the water through the culvert or divert the flow long enough to permit the grout to set.

### Painting the Inside of Water Tanks

*In view of the difficulty of taking water tanks out of service, is it practical to attempt to paint the interior of steel tanks and, if so, at what intervals and under what conditions is this necessary?*

#### Painting Is Necessary

By T. J. IRVING

Division Engineer, Chicago & North Western, Winona, Minn.

The interior of steel water tanks should be painted whenever conditions make it necessary; that is, when the interior begins to rust, scale or pit. Different waters have different actions on the steel and the interval at which these tanks should be painted should be determined by emptying the tank and making a very thorough inspection.

There is usually some time during the year when a steel tank may be taken out of service for at least a week or 10 days, which is sufficient time for scraping, cleaning, putting on paint and allowing it to dry. There are quick-drying paints made especially for this purpose. If the tank is located at a terminal there is generally an emergency way for supplying water for a short time in case the tank is out of service or it is necessary to make repairs on some part of it.

### Rusting Occurs Only in Certain Parts

By J. R. HICKOX

Hydraulic Engineer, Chicago, Burlington & Quincy, Chicago

The Burlington makes a practice of painting steel water tanks whenever an inspection indicates that it is necessary. The length of time between paintings varies with the kind of water that we are storing in the tank.

This year we have been experimenting with several kinds of paint. Our standard paint is the regular tar paint. This is used in tanks containing treated water

that is fairly high in sodium salts where ordinary paint seems to disappear quite rapidly. However, the inside surface of the tank does not rust badly except where the fluctuation of the height of the water in the tank leaves the tank alternately wet and dry. In these tanks rusting also takes place around the tie rods in the top of the tank.

I am of the opinion that we would get about as good results by simply painting the top six or eight feet in most of our tanks as we would by painting the entire inside, as this practice would not take the tank out of service. However, thus far we have never handled the problem in this way.

### It Is Not Worth the Trouble

By F. T. BECKETT

Engineer Maintenance of Way, Chicago, Rock Island & Pacific, El Reno, Okla.

It is not practical. The benefits derived are not worth the labor and inconvenience necessary to paint the interior of a tank. When first constructed a tank should be thoroughly cleaned and given a good coat of metal paint. We have experienced little or no trouble due to lack of paint on the inside of steel water tanks.

### How Complete Should Pile Driving Records Be?

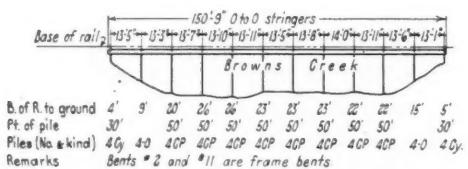
*Is it advisable to make a detailed permanent record of the driving of each pile in a structure or merely of typical ones?*

#### Pile Records Are Important

By F. E. BATES

Bridge Engineer, Missouri Pacific, St. Louis, Mo.

A complete record of piling in a structure is very important, particularly when creosote piling are used, as it permits ordering piling without waste when redriving is necessary. The chart is a reproduction of the form which we use in making a permanent record of our pile



#### A Recommended Piling Record.

trestles. Space is provided to record the distance from base of rail to point of pile and from base of rail to ground line.

For foundation piling under permanent structures such as bridge piers and abutments, a record is kept of the distance from base of rail to point of pile for each pile. Where uniform penetration is secured, the information on each pile is of little value and it would probably be satisfactory to show the average penetration for all the piles under each pier or abutment.

#### Permanent Pile Records Should Be Kept

Pile Driving and Pile Driving Records was the subject of a committee report which was presented at the annual convention of the American Railway Bridge and Building Association in 1922 at Cincinnati, Ohio. The report states that "The importance of making and filing complete and dependable notes of piles, pile driving and soil explorations cannot be over-estimated." Among the advantages to be derived

from these records are mentioned the preparation of data for valuation, the estimating and ordering of material for emergency repairs or the extension of the existing structure.

While the committee presented a number of forms used by various railroads, it did not recommend any particular form but presented recommendations as to the information to be recorded, as follows:

"The heading should contain reference to the location of the work on line or branch, date, contractor, pile driver number, and kind and weight of hammer. In case of the gravity drop steam hammer the make and number should be given, together with the number of strokes per minute, the height of fall and weight of entire hammer and striking part separately. If a double acting steam hammer is used, it is necessary also to record the diameter of the piston."

"The best practice is to number the bents in the direction of the mile posts and the piles from left to right. For piers or other foundations a sketch or pile plan will indicate the system of numbering. The kind of timber or concrete in the pile should be noted. In the case of timber piles the diameter of the tip and butt should be given, and in the case of concrete, the date of manufacture and the name of the manufacturer. Next should be recorded the length of the pile in the leads, the length below cut-off, and the distance from base of rail, top of pier or other reference to the cut-off. The penetration for the last 10 or 20 blows should be given."

The report further recommends the recording of the total penetration and the amount of penetration in the soft and hard materials separately. It also recommends that a column for remarks be provided in which can be placed notes regarding the batter of piles, broken piles, whether rings or shoes were placed on piles, and other information that may be desirable.

### How Should Ties Be Marked?

*What is the best method of marking ties to be renewed?*

#### The Foreman and Supervisors Should Be Held Responsible

By E. E. CROWLEY

Roadmaster, Delaware & Hudson, Oneonta, N. Y.

In the fall of the year it is necessary for the roadmaster to send in an estimate of ties needed for the coming year. This information can be obtained from the section foremen by asking them to make a personal inspection and send in a report, by mile-post locations, of the number of ties to be renewed on their sections. As soon as the roadmaster is advised of the number of ties that he is allotted for the coming year, he should check his allotment against the number of ties asked for by the foremen to make whatever reductions are necessary, so as not to overrun the number of ties allotted to him.

In the spring of the year, as soon as the snow is off the track, the roadmaster should inform each foreman of the number of ties he is to be allotted, and have him go over his section and inspect and mark with a spot of paint the ties which, in his judgment, ought to be replaced during the season. Foremen should be equipped with a tie inspector's hammer or short pick modeled for use in inspecting ties.

In case a roadmaster has any foremen that he cannot depend on to inspect the ties on their sections, he should appoint a foreman from some other section to make the inspection and mark the ties to be renewed.

As soon as the ties have been inspected and marked by the foremen, the roadmaster and his supervisors should check at least two miles on each section to see that there are no ties marked to come out that can go for another year.

On each trip over sections during the tie renewal season, the roadmaster and the supervisors should note the ties marked for renewal and correct apparent errors at once. Only such ties as have been marked should be renewed by the section foremen without further authority. The inspection and marking of ties should be done by the foreman, roadmaster and supervisors, as they are held responsible for the safe condition of track, for if other persons are authorized to do it they will be inclined to be too saving in the renewals which will result in unsafe track conditions.

### Notch Them With a Small Axe

By G. ELIASON

Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Detroit, Minn.

When a section foreman on the Soo Line makes the final selection in the early spring of the ties to be renewed during the season, he carries a sharp hand or chopping axe with him. Whenever, after submitting a tie to the necessary examination and test, he decides that it should be taken out, he makes a small notch in one edge of the tie with the axe. This notch is cut halfway between the end of the tie and the edge of the rail, or as nearly so as the condition of the old tie permits, all marking, of course, being done on the same side of the track and on the same edge of the tie as to direction. The notch is made deep enough to be clear and well-defined but not of such depth or size as to render it unnecessarily conspicuous from passing trains.

Uniformity in the size and location of the marks is essential to this system and not only renders the distribution and placing of the new ties easier, but also facilitates a check inspection by the roadmaster or any other officer of the road, who wishes to make a check on the foreman's judgment. I have followed this plan of marking ties for a number of years and have found it satisfactory.

### Condition of the Ties Should Be Noted Whenever Opportunity Affords

By E. E. BARTON

Roadmaster, Chicago & North Western, Rapid City, S. D.

After the season's tie renewing is completed the section foremen should start marking the ties which are to be renewed the following year. This can be done while the season's work is in progress, that is, while surfacing track, etc.

When track is opened up for tamping the true condition of the ties will be found. It is often the case that ties which look good on top are completely decayed at the bottom. This condition is very deceiving and hard to find when the track is filled in and dressed. Another good time to determine the condition of the ties is while the work of gaging track is being done. Wide gage results from rough track or poor ties. When it is the latter, the section foreman should determine at once what new ties are needed to strengthen that portion of the track and mark the ties he wishes renewed.

This plan gives the roadmaster or supervisor a chance to check his foremen on this important work during the greater part of the year when making their trips over their territories and also gives them a better knowledge of the condition of ties when making the tie esti-

mates which are generally submitted in the fall or early winter.

I have found this plan is more satisfactory than going over the territory for a general inspection of the ties at one particular time of the year, which is quite often a hurry up job.

### Various Methods May Be Used

The committee report on the inspection and identification of ties for renewal presented before the convention of the Roadmasters' and Maintenance of Way Association at Kansas City last October, recommended the marking of ties with paint or notching them with an adze. In discussing this report, J. W. Griffith, roadmaster on the Kansas City Southern, reported that the use of a long-handled stencil brush was of considerable convenience in marking the ties with paint.

With the use of an adze or an axe in marking the ties, practice differs as to the location of the mark. Some maintenance officers favor the cutting of a notch in the edge of the ties, usually outside of the rail, while others prefer to make the cut at the corner of the tie.

While many prefer to mark the ties, others favor the marking of the rail either with a spot of paint or a keel mark. There have been cases where a section foreman has made the identification of broken ties for renewal conspicuous beyond any question by cocking up the ends, but we know of no instance in which this practice has been repeated by the same section foreman after it has been brought to the attention of his roadmaster.—EDITOR.

### Keeping Motor Cars Clean

*What measures can be taken to stimulate interest among the foremen in the care of their motor cars?*

### Let the Foremen Know What Their Neighbors Are Doing

By T. THOMPSON

Roadmaster, Atchison, Topeka & Santa Fe, Joliet, Ill.

A good section foreman is interested in his work and in his motor car also, and as a rule his motor car is kept in good shape and never refuses to work. I consider it a foreman's duty to keep his motor car working and it is on rare occasions that I find it necessary to send a maintainer to repair his car. A good foreman realizes that if the motor car refuses to work, he is losing time with his men in getting to and from work, and as a rule such foremen get to the tool house a little early in the morning and make minor repairs and adjustments to the car to keep it working.

I find it a good idea to send the foremen a statement every two or three months showing the kinds of cars their neighboring foremen are using and how long they have run them without having to call for the repair man. This, as a rule, will put all the foremen in line and they will try to keep their cars running at all times. It is also good practice for the roadmaster to talk to his foremen about the operation of their cars, telling them that their neighboring foremen have run their cars so many months without calling for the repair man.

### Educate the Foreman

By E. M. BOGUE

Section Foreman, Missouri-Kansas-Texas, Yale, Okla.

I suggest that the officers of each district arrange to hold a "motor car meeting" of the foremen one day each month for the purpose of stimulating an interest among them in the care of their motor cars. Another

plan is to hold meetings of a "motor car committee" with representatives from each division, and see that each foreman in the district serves in turn on this committee.

Everyone knows that before one can really be interested in a thing he must know something about it. So it is with foremen and the operation and care of motor cars. Foremen need to be educated to the ways of handling their cars exactly the same as in any of their other work. I have seen men trying to operate motor cars who knew absolutely nothing about them and it is small wonder that their cars soon wore out and caused trouble.

Here are a few things essential to the good care and better service of motor cars. Bolts, taps and nuts must be kept tight. The cars must be oiled properly and kept clean. Attention must be given to the wiring. They must be driven at a reasonable rate of speed and carefully watched to see that the engine does not become overheated. The car must be protected from the weather. These and many more matters could well be discussed thoroughly at motor car meetings, and would arouse interest among all the foremen and would teach them the proper ways of caring for their cars. When foremen know how to care for their motor cars properly, they will have little trouble, and will enjoy operating them.

#### Supervision Is Essential

By H. M. LULL

Chief Engineer, Southern Pacific, Texas and Louisiana Lines, Houston, Tex.

It has been our experience that motor cars that are kept clean are also generally kept well oiled with bolts tightened and are given attention as regards other small details which have the effect of lengthening the intervals between trips to repair shops for overhauling.

Our foremen have been thoroughly instructed as to the care to be given motor cars and special emphasis has been placed on the necessity of keeping the cars clean. Inspection of motor cars is made by the division engineer and roadmaster frequently and a more detailed inspection is made at least once each month by the division motor car mechanic. We have a traveling motor car mechanic assigned to each division. These men cover an average of about 700 miles of road. They are required to make a complete inspection and report on each car encountered on their trips. The reports made invariably contain a specific statement with reference to the attention being given by the foreman in keeping his car clean. Where laxity is reported in this respect the matter is referred to the roadmaster, who takes corrective action.

We find that foremen who have been furnished with new factory-made cars purchased by the company are proud of them and generally keep them in first-class condition. Not so much can be said for some of the old "home made" cars where the engine is owned by the foreman and the frame by the company. Such cars are being gradually worked out of the service by the replacement with new cars owned by the railroad.

#### A Well Organized System of Maintenance Will Get Results

By F. M. THOMSON

District Engineer, Missouri-Kansas-Texas, Denison, Tex.

An interest among foremen in the care of their motor cars can be stimulated by the issuance and enforcement of comprehensive instructions for the proper care and operation of motor cars. Maintainers should be always

on the alert and ready to instruct or co-operate with foremen in the care and handling of their cars. Through a record kept of the condition of all motor cars, foremen displaying the most interest in the care of their cars should be rewarded. This reward may be in the nature of a good word, a commendatory letter, a photograph of foreman with his car printed in the railroad's magazine, or a cash price. Impress foremen with the idea that motor cars must be kept clean and must be inspected regularly by the operator because clean cars give longer service with less trouble and indicate that inspections are being made regularly which will aid in detecting defects before they become serious.

A well organized system of motor car maintenance will do more than anything else towards causing a foreman to appreciate the value of his car and to take an interest in its care. Prompt repairs made in the field by the maintainer and good workmanship on cars overhauled in the shops will be simulated by the foreman in the care and upkeep of his motor car.

#### Checking Levels and Gages

*What measures should be taken to insure the accuracy of section foremen's level boards and track gages?*

##### Examine Them Monthly

By A. J. NEAFIE

Principal Assistant Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

Delaware, Lackawanna & Western standard instructions provide that all track gages and level boards be examined monthly by roadmasters, supervisors or a delegated representative of the company. Level boards or gages found inaccurate will be shipped to the roadmaster's headquarters. Test gages are furnished all roadmasters and supervisors to check the accuracy of field track gages.

#### Proportioning Stairways

*What is the proper relation between the width of treads and heights of risers for stairs?*

##### A Common Rule

By G. H. WILSEY

Chief Engineer, St. Paul Union Depot Company, St. Paul, Minn.

Twice the riser plus the tread equals 25 in. This seems to make a very convenient stair, no matter in what way it is applied, so long as the tread is kept of proper width to make convenient walking. Of course, proportions can be varied somewhat in order to fit into other dimensions of height of risers necessary to make all risers the same in a run of stairs.

##### Several Rules May Be Applied

By A. L. SPARKS

Architect, Missouri-Kansas-Texas, St. Louis, Mo.

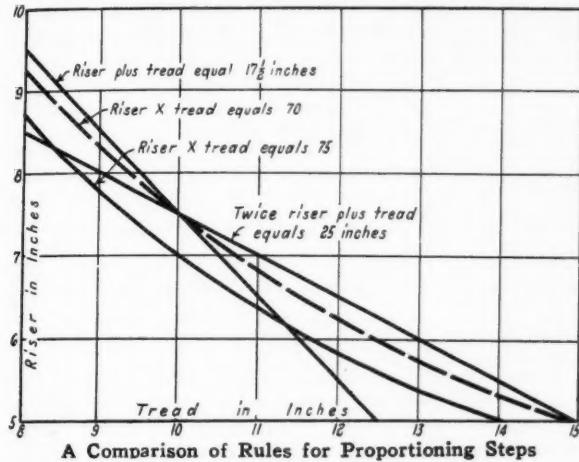
The rise in a stairs is the vertical measurement from the top of one step to the top of the next. The run is the horizontal measurement or width of tread from the face of one riser to the face of the next. The average run is about 10 in. It may be less where there is little room for the total run but is often more in public buildings and on outside steps. The average rise is from 7 to  $7\frac{1}{2}$  in. The rule of proportion most commonly used in determining the height of riser is, "The sum of the rise and run should equal  $17\frac{1}{2}$  in." Another rule is, "The product of the rise and run should equal not less than 70 or more than 75 in."

The general slope of stairs should not be at an angle of incline greater than 50 deg., or less than 20 deg. Marble, stone or cement steps without nosings should have treads not less than 12 in. wide, except on narrow or enclosed stairs.

Ramps should generally be used on slopes where the incline angle is less than 20 deg., except in parks or gardens where the walks are likely to be covered with snow and ice, in which case a very wide tread and low rise is excusable and frequently used.

### A Comparison of Rules

[To afford a comparison of the rules presented in the two replies given, the diagram has been prepared show-



ing the variations in the relation of risers to treads in a graphical way.—EDITOR.]

### Rail-Creeping Causes Wreck

**A**N EASTBOUND passenger train consisting of eight cars was derailed near Shafter, Nev., on the Western Pacific, on July 13, 1925, resulting in the injury of 19 persons.

The train was derailed at 10:40 a. m. while traveling about 20 miles an hour. At the point where the accident occurred the section gang was working, having just installed seven new ties, some of which were placed on the old beds, while new beds had been made for others where the old ties were slewed. The foreman was standing opposite this section of track when the train passed over and noticed the rails kick out about 20 in. to one side under the third car, derailing the next four cars.

In the investigation of this accident the director of the Bureau of Safety concluded that it was "caused by rails kicking out under the train, due to excessive creeping. The weather conditions on the morning of the accident were not in any way unusual, and it is not believed that a sun kink can be held to be the reason for the occurrence of this accident. On the other hand, the investigation indicated that the rails west of the point of accident had been creeping toward the east, while the rails east of the point of accident had been creeping toward the west; at a point 500 ft. west of the point of accident the south rail had crept toward the east a distance of  $5\frac{1}{2}$  in., while at a point approximately 4,500 ft. east of the point of accident the south rail had crept toward the west a distance of 12 in.; the north rail had been creeping in a similar manner, although not to the same extent.

### With the Associations



#### The American Railway Engineering Association

All reports of committees are now completed and in the hands of members. More than 550 reservations have already been received for the annual dinner which will be held on Wednesday evening, March 10. Indicative of the interest that is being taken in the work of the association is the fact that over 40 applications for membership have been received from engineering officers on one road, the Missouri Pacific, during the past year.

The program for the annual convention which will be held at the Congress hotel, Chicago, on March 9 to 11, is as follows:

#### First Day—Tuesday, March 9

- President's Address.
- Reports of Secretary and Treasurer.
- Reports of Standing and Special Committees on: Rules and Organization.
- Ballast.
- Iron and Steel Structures.
- Electricity.
- Economics of Railway Location.
- Water Service.
- Records and Accounts.
- Shops and Locomotive Terminals.

#### Second Day—Wednesday, March 10

- Signals and Interlocking.
- Signs, Fences and Crossings.
- Yards and Terminals.
- Uniform General Contract Forms.
- Masonry.
- Stresses in Railroad Track.
- Rail.
- Track.
- Co-operative Relations with Universities.
- Annual dinner—6:30 P. M.

#### Third Day—Thursday, March 11

- Ties.
- Economics of Railway Operation.
- Roadway.
- Wooden Bridges and Trestles.
- Wood Preservation.
- Clearances—Progress Report.
- Economics of Railway Labor.
- Buildings.
- New Business.
- Election and Installation of Officers.
- Adjournment.

### Roadmasters' Association

The executive committee will meet at the Auditorium hotel at 9 a. m. on Wednesday, March 10, to consider a number of important matters. The meeting will adjourn at 1 p. m. to enable the members to visit the National Railway Appliances exhibit in the afternoon.

The Roadmasters' Association has selected the following committees to study the reports assigned to them and to report at the next convention which will

be held in Chicago in September. The personnel of these committees is as follows:

**Tracks Joints and Their Maintenance:** C. W. Baldridge, chairman, assistant engineer, A. T. & S. F., Chicago; Arthur Craine, district engineer, C. B. & Q., St. Louis, Mo.; John Sheehan, roadmaster, L. V., Jersey City, N. J.; B. E. Haley, general roadmaster, A. C. L., Rocky Mount, N. C.; Philip Chicione, roadmaster, C. P., Vandreil, Que.; and G. H. Warfel, roadmaster, U. P., Kearney, Neb.

**The Collection and Use of Cost Data by Supervising Forces:** E. P. Hawkins, chairman, division engineer, M. P., Osawatomie, Kan.; G. W. Koontz, division engineer, St. L. S. F. & T., Ft. Worth, Tex.; F. R. Rex, supervisor, Penna., Dunkirk, N. Y.; A. A. Cross, supervisor, N. Y. N. H. & H., Framingham, Mass.; M. Donahoe, general roadmaster, C. & A., Bloomington, Ill.; S. A. Bryan, roadmaster, A. C. L., Starke, Fla.; and J. Morgan, supervisor, C. of G., Leeds, Ala.

**The Rearrangement of Track Work to Promote Uniform Forces Throughout the Year:** J. Clark, chairman, supervisor, B. & O., Walkerton, Ind.; C. W. Coil, roadmaster, N. P., Missoula, Mont.; Oscar Suprenaunt, roadmaster, D. & H., Schenectady, N. Y.; W. A. Clark, supervisor, P. & R., Trenton, N. J.; W. E. Carter, supervisor, B. & L. E., Greenville, Pa.; R. H. Smith, assistant superintendent, N. & W., Roanoke, Va.; and W. F. Nichols, supervisor, L. V., Buffalo, N. Y.

**The Construction and Maintenance of Highway Crossings and Their Approaches (including signs) to Promote Safety:** A. E. Preble, chairman, supervisor, Penna., Middletown, Pa.; F. J. Meyers, assistant engineer, N. Y. O. & W., Middletown, N. Y.; A. A. Johnson, supervisor, N. Y. C., Albany, N. Y.; D. C. McGregor, supervisor, B. & O., Pittsburgh, Pa.; E. E. Crowley, supervisor, D. & H., Oneonta, N. Y.; F. W. Hillman, division engineer, C. & N. W., Chicago; and G. T. Anderson, general roadmaster, K. C. S., Texarkana, Tex.

**The Repair of Track Tools:** B. C. Dougherty, chairman, roadmaster, C. M. & St. P., Chicago; M. J. Dillon, roadmaster, M. P., Little Rock, Ark.; J. A. Roland, roadmaster, C. & N. W., Missouri Valley, Iowa; R. J. Yost, roadmaster, A. T. & S. F., Chillicothe, Ill.; and J. B. Martin, general inspector track, N. Y. C., Cleveland, O.

#### Wood Preservers' Association

The Executive committee will meet at the office of the association in Chicago on March 10 to formulate plans for the work of the association for the year now opening.

#### Directory of Associations

- American Railway Bridge and Building Association.**—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 12-14, 1926, Richmond, Va.
- American Railway Engineering Association** (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next Convention, Congress Hotel, Chicago, March 9-11, 1926.
- American Wood Preservers' Association.**—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January, 1927, Nashville, Tenn.
- Bridge and Building Supply Men's Association.**—B. J. Wilson, Pocket List of Railroad Officials, 605 Fischer Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.
- National Association of Railroad Tie Producers.**—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention, January, 1927, Nashville, Tenn.
- National Railway Appliances Association.**—C. W. Kelly, secretary, Seeger Building, 845 South Wabash avenue, Chicago. Annual exhibition at convention of American Railway Engineering Association.
- Roadmasters' and Maintenance of Way Association.**—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 21-23, 1926, Chicago.
- Track Supply Association.**—W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

**Report on Railway Efficiency.**—The Interstate Commerce Commission has advised the Senate in accordance with a request from that body that all of the reports which it is now requiring of the railroads are either "made necessary by some specific administrative duty or are essential to obtain requisite information as to the economy of the operation of the railways, the service rendered to the public, the charges therefor, and the financial condition of the railway companies. For the most part the reports cover matters which railway officials need for the efficient conduct of their business."

## The Material Market

In general the market for engineering materials has been steady throughout the month on a level with the preceding month, although slightly stronger. It is significant that the rail mills are operating generally at full capacity and that new orders or specifications covering earlier orders are being received faster than shipments can be made. With the approach of open weather, it will not be surprising in view of the small reserve stocks of materials being carried to see slightly higher prices in several classes of commodities, particularly structural steel. There appears to be little likelihood of substantial reductions in any prices in the immediate future.

	Pittsburgh	Chicago	Pittsburgh	Chicago
	January		February	
Track spikes	\$2.80 to \$3.10	\$2.90 to \$3.00	\$2.80 to \$3.10	\$2.90 to \$3.00
Track bolts	4.00 to 4.25	3.90 to 4.00	4.00 to 4.50	3.90 to 4.00
Angle bars	2.75	—	2.75	—
Tie plates, steel	2.35 to 2.50	—	2.35	—
Boat spikes	3.25	—	3.25	—
Plain wire	2.50	—	2.55	—
Wire nails, keg	2.65	—	2.70	—
Barb wire, galv.	3.35	—	3.40	—
C. I. pipe, 6 in. to 12 in., ton		50.20		49.20 to 50.20
Plates	1.85 to 1.90	—	1.80 to 1.90	—
Shapes	1.90 to 2.10	—	2.10 to 2.00	—
Bars, soft steel	2.00	—	2.00	—
Rivets, struct.	2.60	—	2.75	—
Conc. bars, billet	2.00 to 2.10	—	2.50 to 2.60	—
Conc. bars, rail	1.80 to 1.90	2.00 to 2.05	1.80 to 1.90	—
Rail, per gross ton, f.o.b. mills		43.00		43.00
		43.00		43.00

The scrap market has been characterized generally by dullness with prices, if anything, a point or more lower than the typical of January. This is because of the light buying by scrap consumers which has compelled the dealers largely to sell at prices at or near buyers valuations.

#### PRICES PER GROSS TON AT CHICAGO

	January	February
Relaying rails	\$26.00 to \$31.00	\$26.00 to \$31.00
Rails for reworking	17.50 to 18.00	16.50 to 17.00
Rails less than 3 ft. long	18.50 to 19.00	17.50 to 18.00
Frogs and switches cut apart	17.00 to 17.50	15.50 to 16.00
Steel angle bars	18.00 to 18.50	17.00 to 17.50

While conditions in the lumber market have not materially changed for several weeks, localized fluctuations have been evident as a result principally of weather conditions which have discouraged building operations in some sections. Prices for railroad materials are about the same except for timbers and car lumber which have responded to temporarily increased demands. It is significant that on the west coast new business has been about 8 per cent below production and shipments about 17 per cent below production. Forty per cent of all new business taken during the last week of record was for future water delivery.

#### SOUTHERN PINE MILL PRICES

	January	February
Flooring, 1x4, B and B flat	\$47.82	\$49.93
Boards, 1x8, No. 1	35.68	35.42
Dimension, 2x4, 16, No. 1 common	28.33	28.45
Dimension, 2x10, 16, No. 1, common	30.09	22.90
Timbers, 4x4 to 8x8, No. 1	28.70	32.70
Timbers, 3x12 to 12x12, rough	42.22	46.29

#### DOUGLAS FIR MILL PRICES

	January	February
Flooring, 1x4, No. 2, clear flat	\$27.00	\$27.00
Boards, 1x8, 6 to 20, No. 1, common	13.50	15.00
Dimension, 2x4, No. 1, common	19.00	17.00
Dimension, 2x10, 16, No. 1, common	18.50	16.50
Timbers, 6x6 to 8x8, No. 1, common	21.00	21.00
Timbers, 10x10 to 12x12, rough	17.00	16.00

Prices for Portland cement in carload lots have been subject to practically no changes from those quoted in the last month's issue.

New York	\$2.15	Minneapolis	\$2.32
Pittsburgh	2.09	Dallas	2.05
New Orleans	2.40	Denver	2.84
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.80

# Railroad News



## Briefly Told

The Illinois Central celebrated its 75th anniversary on February 10, the road having received its charter on that date in 1851.

Lapel Buttons will be awarded by the Southern Pacific (Pacific system) to six employees, one from each division and the general shops, who did the best work in the 1925 safety campaign.

A total of 5,346,914 cars were loaded in the first five weeks of the current year ending February 6, as compared with 5,386,079 in the corresponding period of 1925 and 5,200,287 in 1924. The freight car surplus on January 31 was 250,935.

The Appropriations Committee of the House of Representatives has recommended that the Interstate Commerce Commission be given \$6,153,157 for the fiscal year beginning June 30, 1926. Of this amount \$1,037,010 is recommended for valuation work.

According to reports issued by the American Railway Association the Class I railroads installed 128,557 freight cars and 1,733 locomotives in service during 1925 as compared with 156,414 freight cars and 2,246 locomotives in 1924. These figures include new, rebuilt and leased equipment.

On February 1 the record of freight cars passing Gallitzin, Pa., on the Pennsylvania showed a total of 9,698 cars (east and west). This is the largest figure ever recorded. The longest train eastbound was 85 cars, loaded, and the longest westbound was 115, empty.

Freight traffic moved by the Class I railroads in December was the greatest for any December on record, according to reports compiled by the Bureau of Railway Economics, amounting to 37,868,884,000 net ton miles, an increase of 2,863,136,000 net ton miles or 8.2 per cent over that of December, 1924.

The "Connecting Link" was the nickname chosen by the Chicago & Eastern Illinois from the names submitted in a contest for a nickname which can be used as a trademark. The contest was open to the public and \$100 was offered as the first prize and \$50 as the second. The "Middle Link" was considered the next best selection.

The Louisville & Nashville recently held its regular annual dinners at which service emblems are given to old employees. That for the Nashville division was held at Nashville on January 29, and about 75 employees received the badges of honor. Three men, having each served 50 years, received gold buttons, set with diamonds.

The New England Transportation Company, the bus subsidiary of the New York, New Haven & Hartford, has issued its first complete timetable, giving schedules on 31 routes, six of which are operated by affiliated companies. The table is issued in the form of an 8-page folder, following closely the style of the usual railroad public timetable.

The Chicago, Milwaukee & St. Paul plans to equip the observation cars on its trans-continental trains with flood lights to enable passengers to enjoy the scenery at night. The first of these lights was used on the observation car of the Olympian Limited, which left Chicago on February 1. The lights are mounted so that they may be shifted at will.

A bill proposed by the Railroad Owners' Association has been introduced in Congress providing for the refunding within a period of not exceeding 40 years, at not less than four per cent, of railroad indebtedness to the government arising from the period of federal control. The bill covers indebtedness to the Railroad Administration, as well as

loans made by the Interstate Commerce Commission, and authorizes the Secretary of the Treasury to make arrangements for the extension of the time of payment or for exchange of securities or substitution of collateral.

The legislature of the province of British Columbia has passed an act transferring 16,000,000 acres of land valued at \$80,000,000 to the Pacific Great Eastern to aid the provincial government, which owns the railway, to negotiate its sale. This grant is not to exceed 20,000 acres for each mile of the main line now completed or to be built.

The number of persons employed in maintenance of way and structures on Class I railroads was less by 30,346 in November, 1925, than in October, primarily owing to the seasonal reduction in forces. The number in November was 395,301. The grand total of all employees on the payrolls in that month was 1,788,889, a decrease of 28,149 from the total for October.

The Circuit Court of Appeals, Third Circuit, holds that the duty of an automobile driver approaching tracks where the view is restricted to stop, look and listen where and when these will be effective, is a positive duty; but where the physical surroundings are such as to raise a question whether stopping, looking and listening would have been effective, the question is for the jury.

Class I Railroads in 1925 earned a return of 4.83 per cent on their property investment according to the compilation made by the Bureau of Railway Economics, based on reports from 191 roads representing a total mileage of 237,048 miles. The net railway operating income for the year totaled \$1,136,973,477, as compared with \$986,744,996 in 1924. In total amount this was the greatest on record, although because of increased investment the rate of return was less than in several previous years. Operating revenues in 1925 amounted to \$6,186,608,566, as compared with \$5,987,662,225 in 1924. Operating expenses in 1925 totaled \$4,583,246,375, compared with \$4,559,764,310 in 1924. Maintenance of way expenditures amounted to \$824,892,859, an increase of \$22,224,000 or 2.7 per cent.

A bill has been introduced in Congress providing for the appointment of members of the Interstate Commerce Commission by regions instead of from the country at large as at present. Under the terms of this bill the commission would have 12 members instead of 11 as it is now constituted and the country would be divided into six geographical divisions, each of which would be represented by two members of the commission. The divisions of the country provided for are: New England group, Middle Atlantic group, Lake group, South Atlantic group, Gulf group and Mountain group. The idea behind the bill has been characterized as essentially political since it provides also that not more than six commissioners shall be members of the same political party and requires not less than six years' residence in a state within the group to be eligible for appointment from it.

A bill has been introduced in the legislature of New York designed to regulate the expenditure of state funds, as provided for in the recent constitutional amendment, authorizing the issuance of state bonds to the amount of \$300,000,000 for eliminating grade crossings of railroads and highways. The bill places primary responsibility on the Public Service Commission, which is to designate crossings to be eliminated and specify the manner in which such elimination shall be carried out.

## Personal Mention

### General

**L. K. Sorenson**, chief carpenter on the Chicago, Milwaukee & St. Paul at Harlowtown, Mont., has been promoted to trainmaster, with headquarters at Aberdeen, S. D.

**J. M. Lloyd**, who has been appointed right-of-way agent of the Southern Pacific with headquarters at Houston, Tex., entered railroad service with the Chicago, Rock Island & Pacific in the engineering department, transferring to the Southern Pacific right-of-way department, East and West division in 1910. Mr. Lloyd was in direct charge of the work of preparing an estimate of cost to reproduce the right-of-way, stations and real estate and when this work was completed in 1911 he was transferred to the maintenance of way department, valuation section. Later he returned to the right-of-way department where he remained until the latter part of 1917, when he enlisted in the army, serving as a first lieutenant and captain of infantry. At the close of the war he re-entered the right-of-way department of the Southern Pacific as an engineer, which position he held at the time of his recent promotion.

**Francis Boardman**, who has been appointed assistant terminal manager of the New York Central and the New York, New Haven & Hartford, with headquarters at Grand Central Terminal, New York, was born on August 15, 1875, at Rutland, Vt. He was educated at Phillips Andover Academy and at Yale University, from which latter institution he was graduated in 1897. In 1898 he served on construction work with the Detroit & Mackinac, and in 1899 he took a year's course in civil engineering at Columbia University. In 1899 and 1900 he was employed as transitman on railroad construction in West Virginia with the West Virginia Short Line. In the latter part of 1900 he entered the employ of the New York Central in the engineering department and held positions successively as assistant engineer, supervisor of track, designing engineer and division engineer. He then became manager of buildings, which position he held until the time of his recent appointment to assistant terminal manager of the Grand Central Terminal.

**Henry H. Garrigues**, who has been promoted to general superintendent of the Eastern Pennsylvania division of the Pennsylvania, with headquarters at Harrisburg, Pa., was a maintenance officer by training. He was born on September 4, 1881, at Harrisburg, Pa., was educated at Haverford School and Haverford College. He entered railway service on February 18, 1901, as a rodman on the Belvidere division of the Pennsylvania, at Lambertville, N. J., and was later transferred in the same capacity to Philadelphia and Harrisburg on the Philadelphia division. He then became transitman at Altoona, Pa. He was assistant supervisor at Altoona, Pitcairn, Pa., and Perryville, Md., from January 16, 1904, to December 1, 1908, and on the latter date became supervisor of the Allegheny division. He was transferred successively to the Atlantic, Philadelphia and Baltimore divisions, and later was employed in the valuation department and the general manager's office. On December 8, 1917, he was promoted to division engineer on the Trenton and Philadelphia Terminal division, and on March 1, 1920, was promoted to engineer maintenance of way, which position

he held until May, 1920. Since this time he has been superintendent successively of the Delaware, Atlantic, Philadelphia Terminal and the Cleveland & Pittsburgh divisions, and, at the time of his recent promotion to general superintendent of the Eastern Pennsylvania division, was general superintendent of the Chicago division.

### Engineering

**C. M. Cannon**, division engineer on the Seaboard Air Line at Tampa, Fla., has been appointed division engineer of the Charlotte Harbor & Northern.

**E. C. Gegenheimer**, assistant general yardmaster of the Pennsylvania, with headquarters at Chicago, Ill., has been promoted to assistant engineer on the staff of the chief engineer maintenance of way of the Western region, with the same headquarters.

**A. F. Dorley**, district engineer of the Missouri Pacific at St. Louis, Mo., **E. B. Fithian**, district engineer at Kansas City, Mo., and **W. H. Vance**, district engineer at Little Rock, Ark., have each been given the title of assistant engineer maintenance of way, with the same respective headquarters, and the offices of district engineer have been abolished.

**Frank C. Shepherd**, who has been promoted to chief construction engineer of the Boston & Maine, as noted in the February issue, was born on December 21, 1870, at Gloucester, Mass., and was educated at the Gloucester High School and at the Massachusetts Institute of Technology. He entered railway service in 1902 as a resident engineer on the New York Central, with headquarters at New York, and left the service of the New York Central in 1906. In 1912 he became engineer of construction on the Boston & Maine, and from 1914 to 1917 was valuation engineer. He was the principal assistant engineer from 1917 to 1920, and then became assistant chief engineer, which position he was holding at the time of his recent promotion to chief construction engineer.

**Eugene N. Philips**, who has been appointed assistant valuation engineer of the Bessemer & Lake Erie, with headquarters at Pittsburgh, Pa., was born on December 11, 1883, at Pittsburgh, Pa. He attended Bethany College and the University of Pittsburgh, and entered railroad service in the spring of 1905 as an assistant on the engineering corps of the Baltimore & Ohio. From 1907 to 1909 he was engaged in general contracting work in Florida and in municipal work in southeastern Ohio. Following this, he re-entered the employ of the Baltimore & Ohio in the capacity of transitman and assistant division engineer, serving consecutively at Baltimore, Md., Philadelphia, Pa., and Newark, Ohio. In 1913, Mr. Philips was appointed assistant engineer in the office of the chief engineer maintenance of way on the Pennsylvania Lines West of Pittsburgh, and from 1914 to 1924 he served as pilot engineer and supervising pilot engineer on the same lines, valuation department. In 1924 he became assistant valuation engineer of the Union Railroad, which position he held until the time of his recent appointment also as assistant valuation engineer of the Bessemer & Lake Erie.

**W. D. Simpson**, district engineer maintenance of way on the Seaboard Air Line, with headquarters at Tampa, Fla., has been promoted to assistant engineer maintenance of way, with headquarters at Savannah, Ga. **E. L. Cannon** has been appointed division engineer of the Alabama division, with headquarters at Savannah, Ga., succeeding R. W. Bonney, transferred. **G. W. Shoemaker** has been appointed division engineer of the West Florida division, with headquarters at Tampa, Fla., succeeding **H. O. Kaigler**, who has been transferred to the East Florida division, with headquarters at Sebring, Fla., succeeding **A. O. Wilson**, promoted to district engineer maintenance of way of the Western district, with headquarters at Savannah, Ga. **R. L. Tatum** has been appointed division engineer of the North Carolina division, with headquarters at Hamlet, N. C., succeeding **O. F. McNairy**, who has been promoted to district engineer maintenance of way of the Central district, with headquarters at Jacksonville, Fla. **E. D. Hall** has been appointed division engineer of the South Carolina division, with headquarters at Jacksonville, Fla., succeeding Mr. Tatum, transferred, and



H. H. Garrigues

**C. A. McRae** has been appointed division engineer of the Virginia division, with headquarters at Raleigh, N. C., succeeding **J. W. Sexton**, who has been promoted to district engineer maintenance of way of the Southern district, and of the Charlotte Harbor & Northern, with headquarters at Arcadia, Fla.

Mr. McRae was born on January 22, 1898, at Watkinsville, Ga., and graduated from the Georgia Institute of Technology in 1922. He entered railway service on January 8, 1923, as an engineering inspector in the office of the chief engineer of the Seaboard Air Line. From June 30, 1917, until August 30, 1919, he served on construction work for the United States government, and from July 1, 1922, until January 8, 1923, was engaged in landscape gardening and real estate development. On the latter date he again became an engineering inspector in the office of the chief engineer of the Seaboard Air Line. On February 11, 1924, he was promoted to assistant to the division engineer at Hamlet, N. C. He was promoted to assistant division engineer at Raleigh, N. C., on August 15, 1925, and was holding that position at the time of his promotion to division engineer.

**Raymond C. Smith**, whose appointment as chief engineer on the Minneapolis, Northfield & Southern, with headquarters at Minneapolis, Minn., was reported in the February issue, was born on December 10, 1879, at Kedron, Minn., and graduated from the University of Minnesota in 1904. He entered railway service on April 1 of that year as a transitman on the Canadian Pacific at Ft. William, Ont., being promoted to resident engineer on maintenance at Winnipeg in 1905. From that date until 1914 he served in that capacity at Saskatoon and Moose Jaw, in the latter year being made inspector on tunnel construction at Nelson, B. C. He left the Canadian Pacific to become assistant engineer on the Minneapolis & St. Louis, with headquarters at Minneapolis, in August, 1915, holding this position until May 1, 1919, when he was promoted to principal assistant engineer. He was holding that position at the time of his resignation to become chief engineer of the Minneapolis, Northfield & Southern.

## Track

**J. H. Berger**, roadmaster on the seventh district of the Gulf Lines of the Atchison, Topeka & Santa Fe, with headquarters at Lometa, Texas, has been transferred to the Third district, with headquarters at Temple, Texas, succeeding **F. T. O'Dowd**, who has retired on pension. **F. E. Box**, roadmaster on the Eighth district, with headquarters at Brownwood, Texas, has been transferred to Lometa, to succeed Mr. Berger. **Ward Parks**, roadmaster on the Ninth district, with headquarters at Brownwood, Texas, has been transferred to the Eighth district, in place of Mr. Box. **C. C. Robinson** has been appointed acting roadmaster on the Ninth district.

**A. L. Zimmerman**, assistant engineer on the Gulf division of the International-Great Northern, with headquarters at Palestine, Tex., whose promotion to roadmaster of the Houston division at Houston, Tex., was reported in the February issue, was born at Bryan, Tex., on July 9, 1890. He entered railway service on October 9, 1909, as a chainman on the St. Louis-San Francisco. He served as chainman, inspector and rodman at various points until 1912, when he left the railroad to become a transitman for the Phoenix Construction Company, building transmission lines in Texas and Idaho. From 1913 to 1914 he served as assistant superintendent for the Texas Building Company, during the construction of the Paducah to Roaring Springs extension of the Quanah, Acme & Pacific, in the latter year becoming a transitman and maintenance of way land appraiser for the Gulf, Colorado & Santa Fe. From 1917 to 1919 he was a captain of field artillery in the United States Army, serving overseas for 14 months, and upon his return became land appraiser for the Chicago, Milwaukee & St. Paul. He served as assistant engineer on the International-Great Northern from 1920 to 1921, leaving that road in the latter year to become again a land appraiser for the Gulf,

Colorado & Santa Fe. He returned to the International-Great Northern as assistant engineer in 1922, and was holding that position at the time of his promotion to roadmaster.

## Bridge and Building

**W. A. Davidson** has been appointed general foreman of bridges, buildings and water service on the Southern division of the Gulf lines of the Atchison, Topeka & Santa Fe, with headquarters at Temple, Texas, succeeding **M. R. Tarrant**, who has been promoted to acting trainmaster.

## Purchasing and Stores

**J. W. Moriaety** has been appointed storekeeper of the Charlotte Harbor & Northern, with headquarters at Arcadia, Fla.

**E. C. Hoffman**, assistant purchasing agent of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., has been promoted to purchasing agent, with the same headquarters, and the position of assistant purchasing agent has been abolished.

**George P. Maclaren**, maintenance of way engineer of the Central region of the Canadian National, has been appointed general tie and timber agent, with headquarters at Montreal, succeeding **W. H. Grant**, who has been granted a leave of absence pending retirement after many years of service with the company.

**T. A. Hodges** has been appointed assistant general storekeeper of the Seaboard Air Line and has been temporarily assigned to special duties in connection with building of new lines in Florida. **T. A. Rousseau** has been appointed storekeeper at Howells, Ga., succeeding Mr. Hodges. **A. Hensler** has been appointed assistant storekeeper at Jacksonville, Fla., succeeding Mr. Rousseau.

**Frank Riley**, chief clerk to the general storekeeper of the Chicago & Alton, with headquarters at Bloomington, Ill., has been promoted to general storekeeper, with the same headquarters, succeeding **G. A. Secor**, whose resignation to enter other business was reported in the February issue. **H. Q. Wolfe**, traveling storekeeper, with headquarters at Bloomington, has been promoted to assistant general storekeeper with the same headquarters, a newly created position. **E. L. Murphy**, division storekeeper, with headquarters at Slater, Mo., has been promoted to traveling storekeeper, with headquarters at Bloomington, in place of Mr. Wolfe. **G. H. Wall** has been appointed division storekeeper at Slater, succeeding Mr. Murphy.

## Obituary

**W. J. F. Craig**, superintendent of forestry and fire protection of the Western region of the Canadian National, with headquarters at Winnipeg, Man., died suddenly of heart disease on a train en route to Winnipeg on February 12.

**Benoit Briard**, purchasing agent of the Chicago Great Western, with headquarters at Chicago, died in that city on February 11 after an operation for appendicitis.

**Major Clark R. Fickes**, resident engineer on the Florida East Coast, with headquarters at Jacksonville, Fla., died suddenly in that city on February 8. He had been in ill health for some time although his illness had not been considered serious. Major Fickes was 53 years old at the time of his death. He had specialized on deep foundation problems incident to the construction of railway bridges and was in charge of the construction of the recently completed bridge of the Florida East Coast across the St. Johns river at Jacksonville, Fla., at the time of his death. Previously he had served as resident engineer on the Chicago, Burlington & Quincy in charge of the construction of the bridge over the Ohio river at Metropolis, Ill., and prior to that was employed in a similar capacity in the construction of the bridge over the Red river near Shreveport, La., for the St. Louis Southwestern. During the war he served as a major in the Engineering Corps of the American Expeditionary Forces.

## Construction News

**The Atchison, Topeka & Santa Fe**, jointly with the city of Ponca City, Okla., is preparing plans for the construction of a viaduct over the railway tracks at Grand avenue in Ponca City to cost \$160,000.

**The Boston & Albany** has awarded a contract to the New England Construction Company, Springfield, Mass., for the construction of a third main track from Warren, Mass., to West Warren (4 miles) at an approximate cost of \$250,000. The work includes one bridge, nine culverts,  $\frac{1}{2}$  mile of concrete crib retaining wall and 100,000 cu. yd. of excavation. A contract has been awarded to the Fredenbeck-Billings Company, Boston, for the construction of track canopies and platforms at Springfield, Mass., to cost approximately \$110,000.

**The Canadian National** has awarded a contract to Pacific Engineers, Ltd., Vancouver, B. C., for the construction of two slips, one at Ogden Point and the other at Point Ellice, Victoria, B. C., to be used in the handling of lumber for export. The construction of a passenger station at Kamloops, B. C., is contemplated.

**The Central of Georgia** has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a roundhouse and storehouse at Albany, Ga., to cost approximately \$100,000.

**The Chesapeake & Ohio** has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension from a point near Edwight to Surveyor, W. Va., 19.5 miles.

**The Chicago & Northwestern** contemplates the construction of a three-stall enginehouse and mechanical coal chute at Jewell, Iowa.

**The Chicago, Rock Island & Pacific** has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of a 300-ton frame coaling station at Enid, Okla. The construction of the following has been authorized: A cut-off from Homestead, Okla., to Okeene, a distance of approximately 10 miles; extension of roundhouse and terminal at Burr Oak, Ill.; track elevation in Chicago and Oklahoma City, Okla.; and 7 coaling stations, 12 cinder pits, 4 water washout plants and 14 water treating plants.

This company contemplates the construction of a new depot and eating house at Tucumcari, N. Mex., at a cost of \$69,000, and of a warehouse at Kansas City, Mo., to cost \$55,000.

**The Cleveland, Cincinnati, Chicago & St. Louis** has awarded a contract to the Walsh Construction Company, Davenport, Iowa, for the construction of a second main track and relocation of the line from Bellefontaine, Ohio, to West Liberty, 8 miles, at a cost of \$1,700,000. The joint contract has been awarded to the M. E. White Company and the Walsh Construction Company for the construction of a second main track and grade revision between West Liberty and Glen Echo, Ohio, 18 miles, at a cost of \$1,760,000. The following construction projects have been authorized: engine terminal at Kankakee, Ill., to cost \$264,000; second track in Columbus, Ohio, to cost \$66,000; bridge No. 282 at Cardington, Ohio, to cost \$65,000, and a grade separation at Lima Road, Huntsville, Ohio, to cost \$90,000. A contract has been awarded to the Bethlehem Steel Company for a turntable to be installed at Hillsboro, Ill.

**The Colorado & Southern** will construct a passenger station this year at Trinidad, Colo., at a cost of \$75,000.

**The Great Northern** has begun the reconstruction of a dock at Seattle, Wash., which was partially destroyed by fire last summer. The cost of the work is estimated at \$50,000.

**The Gulf, Colorado & Santa Fe** is receiving bids for the construction of several shop buildings at Cleburne, Tex. suburban station on a site east of the present station at

The Illinois Central will construct at once a temporary

Randolph and South Water streets, Chicago. As soon as the temporary station is put into operation the present station will be removed and the site will be occupied by the permanent suburban station. The construction planned for the immediate future will cost approximately \$2,400,000.

**The Illinois Central** is receiving bids for the construction of a water station and the digging of a well at Osage, Iowa.

**The Los Angeles & Salt Lake** is receiving bids for the construction of living quarters for company employees in Cedar City, Utah, to cost \$25,000. Company forces will construct the following facilities: an 18,000-gal. per hour capacity water softener with pipe lines and stand pipe at Lynndyl, Utah, to cost \$26,000; 20 additional cabins for tourists at Bryce Canyon, Utah, to cost \$120,000; 15 additional cabins for tourists, and the enlargement of the present pavilion by adding wings and an extension of the second story over one-half of each additional wing at Zion National Park, Utah, to cost \$120,000.

**The Missouri Pacific** has awarded a contract to the List Construction Company, Kansas City, Mo., for the construction of 19 miles of second track between Washington, Mo., and Jefferson, and another contract to Winston Brothers Company, Minneapolis, Minn., for the construction of 3 $\frac{1}{4}$  miles of second track along the same line. The total cost of the 22 $\frac{1}{4}$  miles of second track is estimated at \$2,954,000. Contracts have been awarded to the Ogle Construction Company, Chicago, for the construction of concrete coaling stations at Archie, Mo., and Centerview, each to cost \$45,000. A contract has been awarded to the Folwell-Ahlskog Company, Chicago, for the construction of a work house for the grain elevator at Kansas City, Mo., to cost \$550,000. A contract has been awarded to the Pittsburgh-Des Moines Steel Company, Des Moines, Ia., for the erection of a steel water tank and the laying of pipe lines at Jefferson City, Mo., at a cost of \$30,000. A contract has been awarded to Frankman Brothers Bridge & Construction Co., St. Louis, Mo., for the installation of a truss span and the protection of new piers for a bridge at Kragen, Ark., at a cost of \$138,000.

**The Michigan Central** has authorized the construction of a power plant for shops at West Detroit, Mich., to cost \$215,000; an inbound freighthouse at Detroit to cost \$100,000; and an office building for the operating department at West Detroit to cost \$54,000.

**The Minneapolis, St. Paul & Sault Ste. Marie** has been authorized by the Interstate Commerce Commission to abandon the branch line from Western Junction, Wis., to Philox, 10.98 miles. This branch was a part of the former Wisconsin & Northern and served a lumber operation which has since ceased to operate.

**The Missouri-Kansas-Texas** will construct with company forces extensions to yard tracks at Parsons, Kan., at a cost of \$52,000. Bids will be received for the replacement of 670 lineal feet of open deck trestle bridges with concrete bridges on various divisions on the Northern lines at a cost of \$45,000, and for the replacement of 1,705 lineal feet of open deck trestle bridges with concrete bridges on various divisions on the lines in Texas at a cost of \$100,000.

**The Northern Pacific** has authorized the following construction projects: A bridge over city waterway at Tacoma, Wash., to cost \$90,000; bridge on the Rocky Mountain division, to cost \$50,000; grade separation at Minneapolis, Minn., to cost \$250,000; under crossings at Coon Creek, Minn., and Billings, Mont., to cost \$42,000 and \$75,000, respectively; boiler washing plant at Livingston, Mont., to cost \$40,000; passenger station at Wapato, Wash., to cost \$50,000, and a water-treating plant at Mandan, N. D., to cost \$25,000.

**The Naples, Seaboard & Gulf** has had the time when the construction of its new line in Florida must be started, extended by the Interstate Commerce Commission until March 5.

**The New York, New Haven & Hartford** has authorized the widening of No. 1 platform at its Cedar Hill (New Haven, Conn.) transfer at an estimated cost of \$60,000.

**The New York, Pittsburgh & Chicago's** application for a

certificate for the construction of a new line across Pennsylvania from Allegheny, Pa., to Easton, has been given a further hearing by the Interstate Commerce Commission.

The Norfolk & Western has awarded a contract to the Roberts & Schaefer Company, for the construction of a 2,000-ton, 6-track, automatic, roller skip type coaling station and gravity sanding plant at Portsmouth, Ohio, to cost approximately \$125,000.

The Oregon Short Line will construct with company forces the following facilities, plans for which have been prepared: a 50,000-gal. wooden water tank, on a 27-ft. tower with water column and 10,500 ft. of 6-in. pipe line, at Georgetown, Idaho, to cost \$32,000; a brick boiler washout building, 34 ft. by 44 ft., equipped with four tanks and four pumps, at Pocatello, Idaho, to cost \$42,000; a power plant and equipment at Pocatello, to cost \$79,000; a 200,000-gal. steel water tank with two pumps, at Salt Lake City, Utah, to cost \$33,000; a freight and passenger station at American Falls, Idaho, to cost \$26,000; a 35-ton mechanically operated coal chute with pneumatic sanding facilities, at Ontario, Ore., to cost \$71,000.

The Pennsylvania has awarded contracts to the T. J. Foley Construction Company, Pittsburgh, Pa., for the following work: New yards and buildings at Altoona, estimated cost, \$465,000; a coal dock at Wierton, W. Va., estimated cost \$60,000; a scrap dock at Rochester, Pa., estimated cost, \$60,000; and a bridge at Hollidaysburg, Pa., estimated cost, \$50,000. Bids will be asked for in the latter part of March for a double track, reinforced concrete viaduct to replace the existing tracks at grade from Twenty-fifth street and Grays Ferry avenue, crossing Washington avenue to Passyunk avenue, in Philadelphia, Pa., a length of 1½ miles, eliminating 13 grade crossings. Twenty-fifth street will be opened underneath and along both sides of the viaduct. Twenty or more cross streets will pass under the new viaduct. The cost of the work will be \$3,000,000, of which 50 per cent will be paid by the city of Philadelphia and 50 per cent by the railroad company. Work will soon be started to carry out the first step of an improvement program designed to effect an extensive increase in the capacity of the yards of this company on its main line at East Altoona, Pa. The initial step includes replacing the present track scales with two of the "plate fulcrum" type, each 62 ft. in length; also the building of a mechanical hump and general revision of the eastern classification yard. It is estimated that these changes will permit the handling of approximately 300 more cars a day than at present. The ultimate scope of the program involves consolidation of the two present classification yards, and various other improvements, which will increase the combined capacity of the receiving and classification yards from 3,492 cars, as heretofore, to 4,589 cars. This company will construct 45 miles of second track on the St. Louis division west of Terre Haute, Ind., at an estimated cost of \$3,500,000. The project includes 10.3 miles of second track between Altamont, Ill., and Brownstown, 12.7 miles from Pierron to St. Jacob's, and 22 miles from Casey to Montrose.

The St. Louis Southwestern plans the following construction work for this year: Grade reduction on Gilkerson Hill at Gilkerson, Ark., to cost \$103,000; construction of 200-ton coaling station at Malden, Mo., to cost \$31,000; and construction of approximately 11,000 ft. of lap sidings at Mesler, Mo., and Randles, to cost a total of \$53,000.

The Sacramento Northern has been authorized by the Interstate Commerce Commission to acquire trackage rights over the San Francisco-Sacramento Railroad from West Sacramento, Cal., to Lisbon, 8 miles, and to construct a 13-mile extension southward from Lisbon.

The San Juan Basin Line has revised its plans for the construction of its projected line from Albuquerque, N. Mex., to the San Juan Basin, to make Farmington, N. Mex., the terminus instead of Cuba. Grading is already under way between Albuquerque and La Ventana, 25 miles. The line is being promoted by Sidney M. Weil of Albuquerque.

The Southern Pacific is preparing plans for the construction of a 240-ft. steel and reinforced concrete span bridge

over the Rio Grande river at Hidalgo, Tex., to cost \$110,000. Plans are being prepared for the construction of a freight station at West Bakersfield, Cal., to cost \$170,000. Plans are being prepared for the construction of an 18-stall roundhouse and a machine shop at Eugene, Ore. A contract has been awarded to Bent Brothers, Stockton, Cal., for the construction of a concrete fuel oil tank at Tracy, Cal. The tank will be 1,300 ft. long and 600 ft. wide and will hold approximately 3,000,000 barrels of oil. A contract has been awarded to Dwight P. Robinson & Company, New York, for the construction of a freight terminal at Houston, Tex., estimated to cost approximately \$1,000,000. The terminal will include a freight depot, freight warehouse, transfer platform and trackage facilities and will cover an area of approximately 30 acres. The headhouse and office building will be concrete and brick, two stories in height, with dimensions of 202 ft. by 40 ft. The inbound freighthouse will be 1080 ft. by 45 ft., and the outbound freighthouse 1140 ft. by 28 ft.

The Southern is receiving bids for the construction of a freight depot at Anniston, Ala.

The St. Louis Connecting has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line of 9.2 miles, from Collinsville, Ill., to St. Jacob, as a change of location for the Pittsburgh, Cincinnati, Chicago & St. Louis.

The St. Louis-San Francisco is receiving bids for the construction of a freight depot at Springfield, Mo.

The Union Pacific has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension of a branch line 10 miles southerly from a point near Yoder, Wyo.

The Wabash is receiving bids for the construction of a passenger station at Granite City, Ill.

## Equipment and Supplies

The Chicago, Rock Island & Pacific has ordered 28,000 tons of rails from the Illinois Steel Company and 5,000 from the Inland Steel Company. It has also ordered 8,000 tons of track fastenings.

The Delaware, Lackawanna & Western is inquiring for 1,000 tons of steel for 1926 requirements and has ordered 1,400 tons of steel for a bridge at Owego, N. Y., from the American Bridge Company.

The St. Louis Southwestern has ordered 10,000 tons of rail from the Illinois Steel Company, and 3,200 tons from the Bethlehem Steel Company.

The Wabash has ordered 520,000 tie plates from the Illinois Steel Company, 280,000 from the Inland Steel Company, 100,000 from the Scullin Steel Company, and 100,000 from the Interstate Iron & Steel Co.

**Concrete Heaters.**—The H. H. Kress Company, Philadelphia, Pa., has issued a four-page leaflet describing and illustrating the use of its concrete heater for the heating of the water and the aggregates used in the mixing of concrete for placement during the winter. This leaflet shows the application of the heater to a variety of concrete mixers.

**The Use of Pre-Cast Units.**—The Portland Cement Association has reprinted in bulletin form the report of the Committee on Pre-cast Concrete Units, which was presented before the convention of the American Railway Bridge and Building Association at Buffalo, N. Y., in October. This report, which was abstracted in *Railway Engineering and Maintenance* for November, reviews the entire subject of pre-cast unit construction as applied to railroad work and covers the subject in a broad way.

**Celite.**—The Celite Products Company, Los Angeles, Cal., has issued Bulletin 314 of 12 pages outlining the characteristics of this material and the effect of its use as an admixture of concrete. It is illustrated with photographs of structures in which it has been used, particular attention being given to pavements, tanks and concrete in sea water.

## Supply Trade News

### General

**R. H. Laverie & Sons, Inc.**, New York, inspection and testing engineers, are now affiliated with the new firm of **Charles Warnock & Co., Limited**, of Canada. Work booked by the Laverie Company for execution in Canada will be cared for by the Warnock Company, and Warnock orders booked in Canada for execution in the United States and Europe will be executed by Laverie in United States, and the Bureau Veritas in Europe. **R. H. Laverie & Sons, Inc.**, are sole representatives of the Bureau Veritas in the United States and Canada. **Charles Warnock**, president of the newly incorporated firm of Charles Warnock & Co., Limited, Montreal, was born at

Fort William, Ontario, on November 9, 1873. He was educated at Lake Forest University near Chicago and later was employed by the Illinois Steel Company and other metallurgical firms for a period of eight years. In 1902, he joined the staff of Robert W. Hunt & Co., in the United States. A year later he was sent to Montreal as the company's first Canadian representative. He opened the Hunt Company's office in Montreal as manager, and on the death of Thomas Irving, became vice-president and general manager of Robert W. Hunt & Co., Ltd. On the death of Captain Hunt in 1923, Mr. Warnock was elected president of that company, which office he recently resigned to form his own inspection and testing company. **H. W. Greene** is associated with Mr. Warnock in the new company.

The Celite Products Company has moved its San Francisco, Cal., office from the Monadnock building to 140 Spear street.

The corporate name of Orton & Steinbrenner Company, Chicago, has been changed to the **Orton Crane & Shovel Company**. No change in the ownership, management or officers is involved, the name being changed to describe better the company's principal activity which is the manufacture and sale of locomotive cranes, crawling tread cranes, gas, electric and steam shovels, draglines and grab buckets.

The Northwestern Motor Company, Eau Claire, Wis., has appointed the following representatives: **W. Newton Jeffress, Inc.**, Washington, D. C.; **Shaffner & Allen**, New York; **Otis B. Duncan**, Chicago; **A. A. Culp**, Birmingham, Ala.; **William J. Roehl**, St. Louis, Mo.; **Rank & Goodell**, St. Paul, Minn.; the **W. H. Worden Company**, San Francisco, Cal.; the **Western Railway Supply Company**, Portland, Ore., and the **Koppel Industrial Car & Equipment Company**, Koppel, Pa. **W. Newton Jeffress** of the Washington office has been appointed manager of sales for the Eastern region.

### Personal

**C. L. Sidle**, salesman in the industrial water softener department of the **Wayne Tank & Pump Co.**, Ft. Wayne, Ind., has been promoted to sales manager of that division, to succeed **E. L. Horiskey**, resigned.

**S. L. Henderson**, who resigned from the engineering department of the Canadian National Railways in November 1925, now represents the railway appliances division of the



Charles Warnock

**American Fork & Hoe Company**, with office at 17 Battery Place, New York City.

**P. E. Krider**, district manager of **S. F. Bowser & Co., Inc.**, Ft. Wayne, Ind., with headquarters at Chicago, has been promoted to manager of railway sales to succeed **E. M. Harshbarger**, who has been appointed district manager, with headquarters at New York.

**L. G. Pritz**, vice-president in charge of all operations of the **United Alloy Steel Corporation**, has been promoted to vice-president and general manager, with headquarters at Canton, Ohio. **George H. Charls**, vice president and general manager, has been elected president.

**L. G. Otley** has been appointed vice-president of the **Otley Paint Manufacturing Company**, to succeed **B. F. Brown**, resigned. **H. Okin**, counsel, has been appointed secretary, to succeed **M. G. Lindsay**, resigned. **A. M. Anda**, accountant, has been promoted to assistant treasurer.

**A. H. Purdom**, formerly connected with the railroad department of Johns-Manville, Incorporated, Chicago, Illinois, has resigned to take a position in the railway department of the **Wood Conversion Company**, 310 South Michigan avenue, Chicago, manufacturers of refrigerator and passenger car insulations.

**Warren Roberts**, president of the **Roberts & Schaefer Company**, Chicago, has been elected chairman of the board, a newly created office, and will be succeeded by **Edward E. Barrett**, vice-president. **Frank E. Muller**, second vice-president has been promoted to first vice-president. **Clyde P. Ross**, third vice-president, has been promoted to second vice-president. **Ray W. Arms**, manager of the coal cleaning department, has been promoted to third vice-president.

**R. M. Thomas** and **Donald Charlton** have been appointed technical representatives of the **Reading Iron Company**, Reading, Pennsylvania. The technical department which they head is a newly created service division in the sales department. Virtually all their time will be given to railroad work and they will be required to give technical and practical counsel to any railroad which has pipe, engine-bolt, stay-bolt and boiler tube problems.

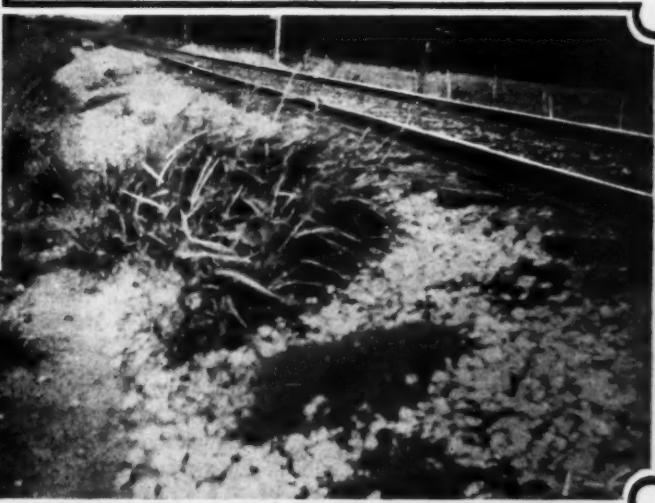
**W. B. Causey**, formerly division superintendent of the Chicago Great Western, and more recently city manager of Norfolk, Va., has been elected vice-president of the **M. E. White Company**, with headquarters at Chicago. He was born on June 24, 1865, at Suffolk, Va., and entered railway service as a chainman on the Atlantic & Danville in 1883. Until 1914 he was with the engineering department of various railways, including the Union Pacific, the New York, New Haven & Hartford, the Chicago & North Western, the Chicago Great Western, as superintendent, and the Chicago & Alton, as superintendent of Illinois lines. From 1914 to 1917 he was vice-president and general manager of the Norwood-White Coal Company at Des Moines, Iowa. He was appointed a captain in the U. S. Army on June 13, 1917, and was assigned to the Seventeenth Engineers. He was promoted to major on March 18, 1918 and to lieutenant colonel in September, and was sent to Vienna, Austria, as coal and transportation expert. From January to October, 1919, he was president of the Allied Railway Mission for Austria and Hungary, and from September, 1919, to July, 1923, was technical adviser to the Austrian government. Since September 1, 1923, he has been city manager of Norfolk, Va.

### Trade Publications

**Technical Bulletin**.—The Southern Pine Association, Architectural and Engineering Service Department, has issued Technical Bulletin No. 1 on Southern yellow pine flooring. It is the first of a series of bulletins to be issued from time to time, containing information about the physical characteristics of wood, its manufactured sizes, shapes and grades. These bulletins are designed to form a complete condensed library of usable working information. Bulletin No. 1 on flooring covers such sub-divisions as quality, sizes, edge grain, flat grain, etc., recommended uses of grades and sizes and instructions for the laying of yellow pine floors.



## NON-POISONOUS Comparison



# ATLAS

**NON-POISONOUS WEEDKILLER**

*New in principle—Superior in results*

**UNDER SEVERE TEST  
Proves More Efficient and Less Costly**

IN 1925, this company treated two parallel lines of railroad for 200 miles. Each road has the same ballast, climatic and vegetation conditions. ATLAS "A" was used on one and ATLAS NON-POISONOUS on the other. Reference to photographs above shows about the same vegetation conditions, Johnson Grass. It cost \$10.00 per mile less to treat the track with Atlas Non-Poisonous Weedkiller, and a cleaner job resulted, although the unit cost per gallon was very much higher than the Arsenical product.

Full Details Upon Request

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Executive Office  
BOUND BROOK, NEW JERSEY

Bound Brook, N. J.

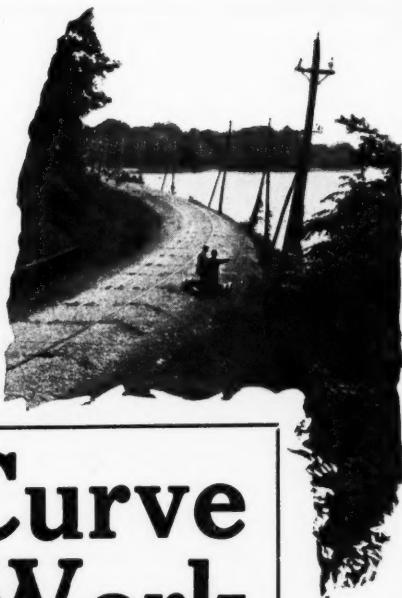
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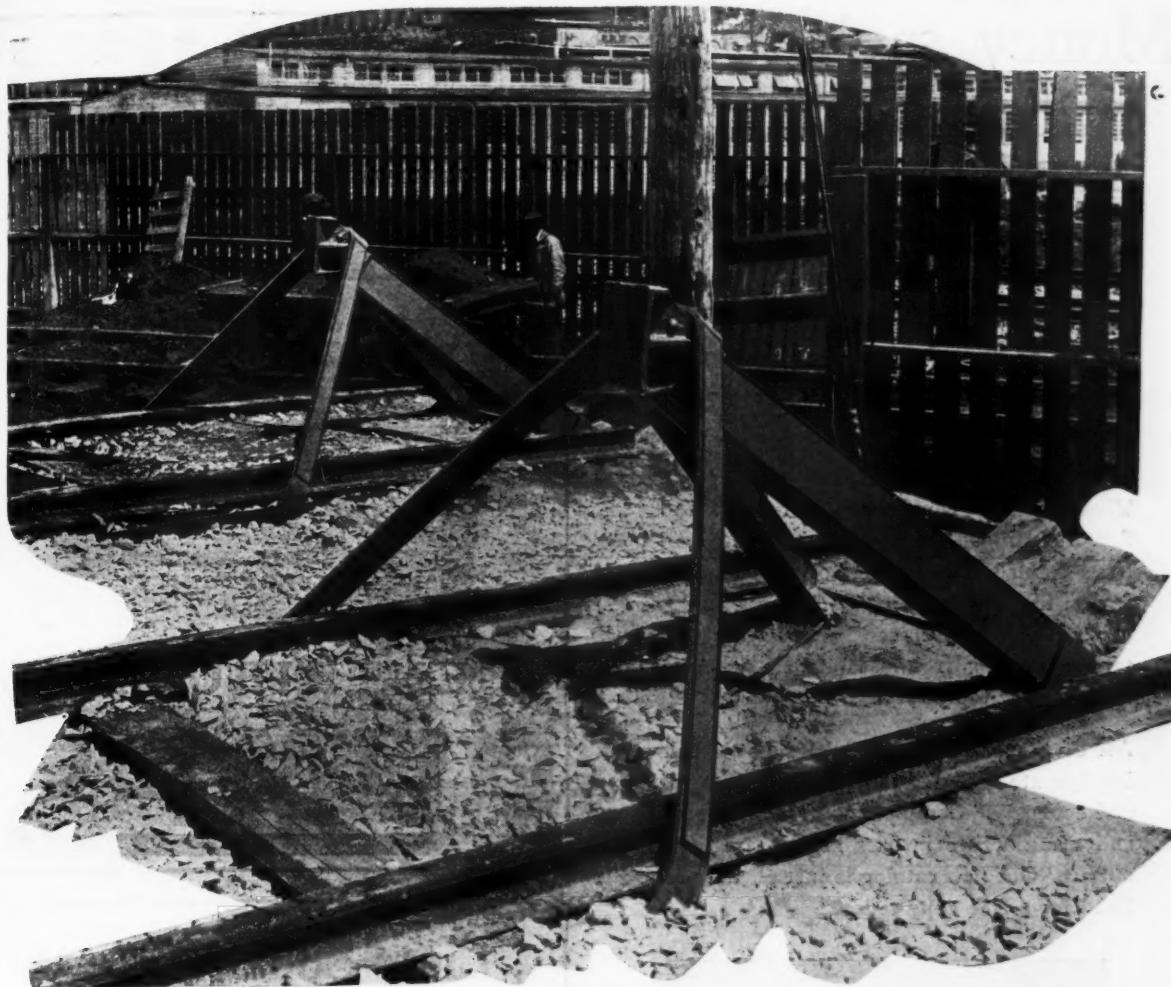
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A BETTER BUMPING POST—WE OFFER  
THE LAWRENCE ALL STEEL POST**

It anchors to the earth and takes the shock into the earth, which acts as a cushion.

Under a *very severe blow* it gives back dragging the earth with it thus protecting cars, contents of cars, and the post itself.

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THE ALDRICH PUMP COMPANY  
RIVER PARK AND PINE STREET  
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# CENTRIFUGAL PUMPS

## Lime-Soda Water Softeners

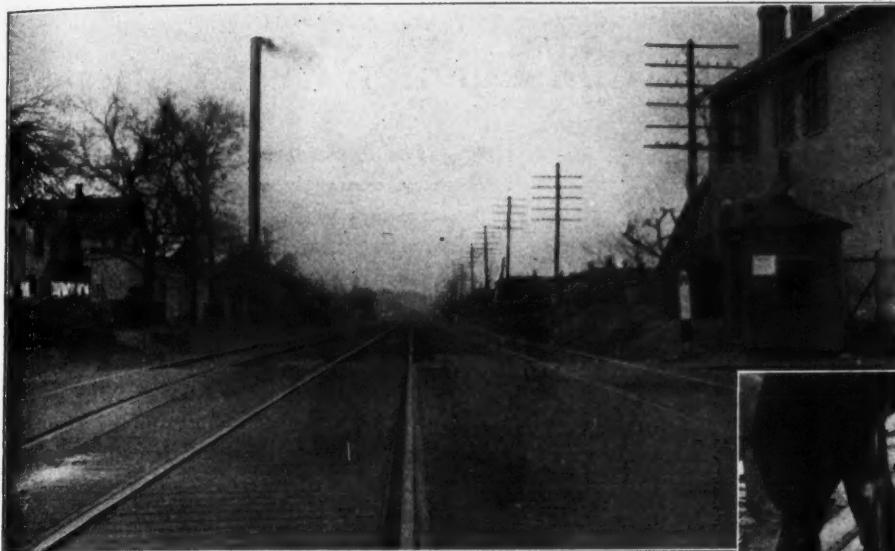
We make LIME-SODA WATER SOFTENERS of both the ground operated and top operated types to purify water for prevention of scale deposits and corrosion in locomotive boilers.

The saving that is being effected by purifying water is most ably portrayed in the recent report of the Water Service Committee at last year's Chicago Convention of the American Railway Engineers' Association. We recommend this report for your careful consideration.

Write for our literature which gives, in detail, the results of our twenty-three years' experience in furnishing WATER SOFTENER PLANTS to twenty-six American Railroads.

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*Specialists for twenty-three years in Railroad  
Water Purification*



The view at the right shows Elastite Preformed Track Pavement in the process of being installed at a grade crossing. The view above shows the trim appearance of the finished job.



## NEW! An improved method for paving grade crossings *Knits and heals under traffic!*

PAVEMENT disintegration at grade crossings has always presented a serious problem of railway maintenance. But now a most important forward step in the solution of this problem has been made.

This improvement—developed by The Philip Carey Company—involves the use of a special asphaltic paving. Carey Elastite Preformed Track Pavement is its name. It consists of sections of rail filler and 2" pavement slabs—both made from a fibrous asphaltic compound of unique character which makes it especially suited to this purpose.

This new system of paving track areas make track and pavement one unit and completely excludes water and frost. Can be quickly and easily installed in all conditions of temperature and climate. Installations already made have withstood temperature extremes from zero to over 100° F. It is low in first cost—and has a durability that is truly astonishing. For the fibre-reinforced mass neither creeps nor disintegrates—and has the peculiar property of knitting and healing under traffic!

Write, today, for complete information.

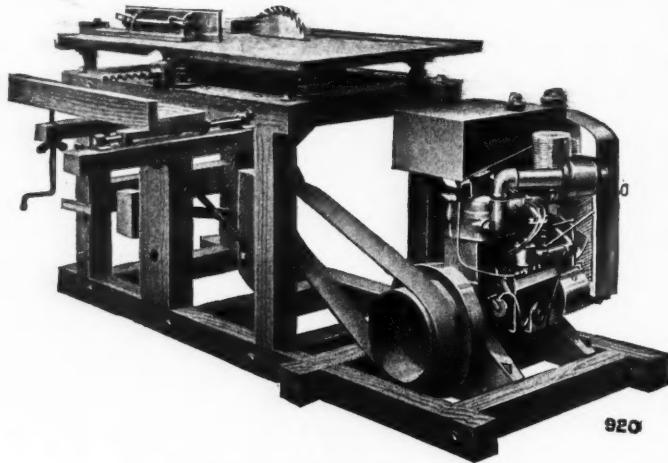
**The Philip Carey Company**  
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—in the Chicago Coliseum, stop at booth No. 219 to see the Carey exhibits of Elastite Preformed Track Pavement, the Carey System of Track Insulation, and other Carey products designed to improve service and decrease maintenance expense.

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“KNITS AND HEALS UNDER TRAFFIC”

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Portable Variety Woodworker

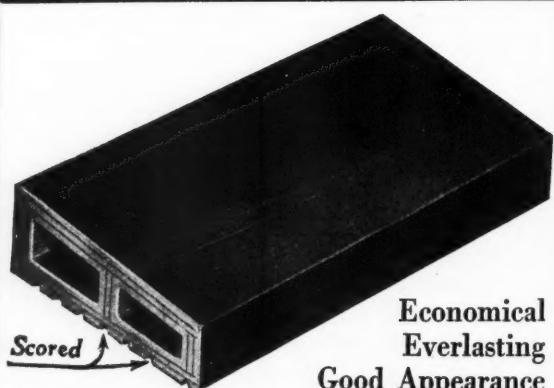
The Portable Variety Woodworker is an energetic workman, that never sulks, nor gourches, nor asks for more pay; one that eliminates the burdensome manual labor of ripping, cutting-off and planing, and performs many other useful operations with surprising ease and dispatch.

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164 Main St., Hackettstown, N. J.



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Everlasting  
Good Appearance

## Facewall Coping

Vitrified Salt Glazed Clay Wall Coping is the most economical Wall Coping obtainable, because it resists all destructive elements acting on an exposed wall. Rain, heat, frost, snow or acids cannot effect the everlasting and impervious Vitrified Salt Glazed Clay from which Dickey Wall Coping is made.

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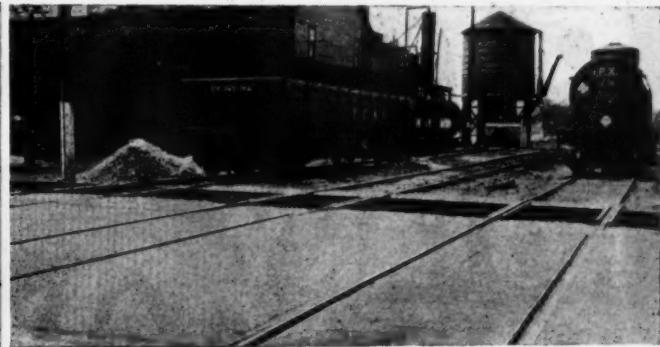
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THE Pease Peerless Continuous Blue Printing Equipment prints, washes, potashes and dries by one continuous operation. It will turn out four times as many blue prints in one hour, with one operator, as can be turned out on ANY blue printing equipment where independent methods of washing and drying are used.

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Repair  
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**Simpler to build  
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***makes better crossings  
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**K**YROCK grade crossings, trucking and station platforms offer you simpler construction, longer life, easier maintenance—and less of it. A "Kyrock" surface will transform your old, worn brick, wood or block platforms into smooth, resilient pavements, at minimum cost.

"Kyrock" is shipped in open cars. It is laid cold. It can be stored in the open without damage. It does not lose its life. Cut it for track repair and the refill irons out under traffic, leaving no trace. It is a perfect waterproofing and non-conductor. There is no waste to "Kyrock." It requires no mixing or heating. It is foolproof. Any section crew can lay it successfully without special equipment. It stays put in any climate.

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During the past two or three years there has been an enormous increase in the use of this product by Railroads for railroad crossings and station platforms and other uses. Great satisfaction has been obtained by every railroad that has used the product. Enormous saving in up-keep has resulted—ultimate cost being greatly reduced.



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The material is shipped in open top coal cars ready to lay COLD. Any section crew with ordinary tools can do the work. If rollers are available, we recommend them. If not, it can be satisfactorily hand tamped.

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# BLOXHAM

## Track Liners



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Many users of Dixon's Paint have certified to its long service record of from five to ten years and even more.

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Because they are constant in service, fool-proof, practically indestructible and therefore especially adapted to railroad service.

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MURDOCK Patent Bubbler Head

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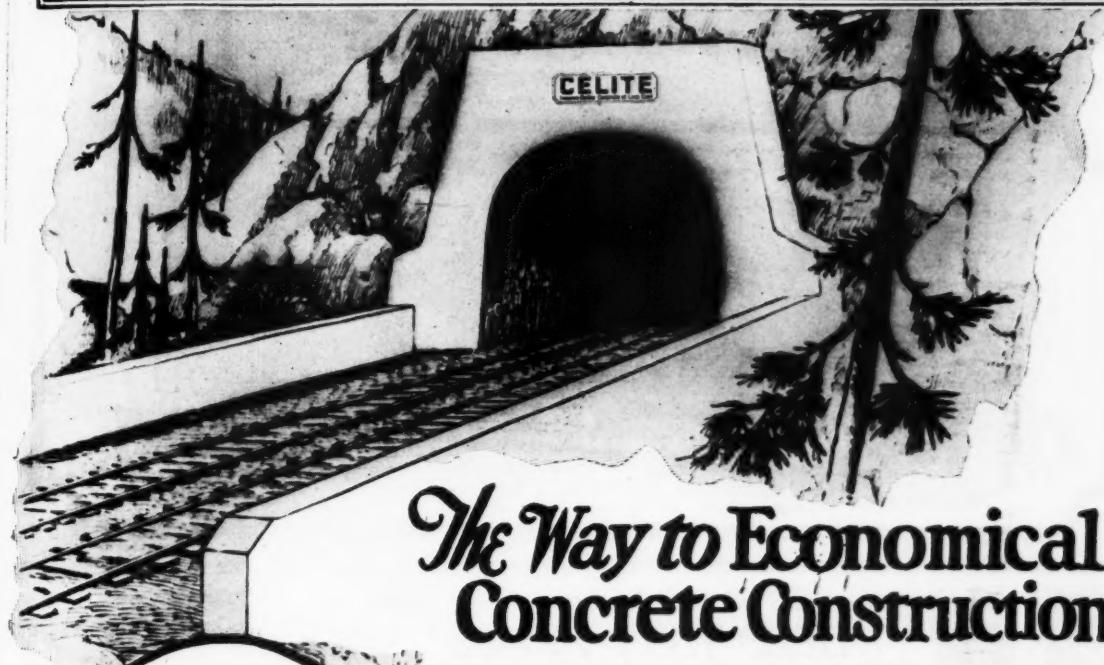
Railway Water Service Boxes for train sheds,  
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**Insures Better Concrete at Less Cost**



## The Way to Economical Concrete Construction

CELITE is a finely ground mineral powder composed of practically pure amorphous silica.

It is added to a concrete mixture with the other dry materials at the mixer, in quantities of two to six per cent of the Portland cement content depending on the mix and the character of the aggregates.

This admixture neither hastens nor retards the setting of the concrete. It does not take the place of Portland cement.

The sole functions of Celite in a concrete mixture are to increase its workability without the use of excess mixing water, to prevent segregation, to insure uniformity, density and water-tightness and to improve the finish and the quality of the final concrete.

The workability of a concrete mixture, which determines the amount of labor necessary to place it properly, is greatly improved through the use of the admixture Celite.

The inactive powder acts as a stabilizer in the mix, keeping the coarse aggregate and sand, water and cement in exactly the same relationship throughout handling and placing as when discharged from the mixer.

It enables the successful placing of concrete of relatively dry consistencies, in the most intricate of forms. It is a boon to gunning and chuting, and the use of central mixed concrete.

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Wherever concrete is used—in tunnels, bridges, dams, culverts, retaining walls, pavements, foundations and concrete buildings—it pays to employ this workability admixture.

A Celite engineer is always at your command at a nearby office to show you the way to better concrete at less cost through the use of this material. Write for Bulletin S-114 which describes its application in all classes of concrete construction.

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*Announcing the greatest forward step in recent years in*

## DEEP WELL PUMPS

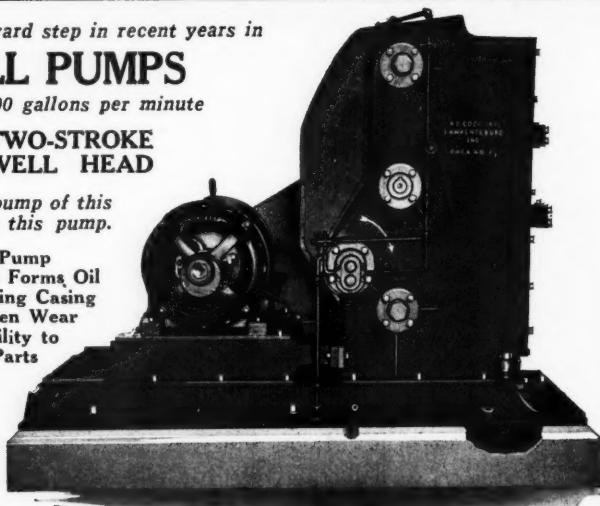
*For capacities up to 500 gallons per minute*

### COOK OVERLAPPING TWO-STROKE SELF OILING DEEP WELL HEAD

*Every feature desirable in a pump of this character is incorporated in this pump.*

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**THRUST ON CROSS HEAD GUIDES PRACTICALLY ELIMINATED.  
ALL SHAFTS IN REMOVABLE BRONZE BUSHINGS.**

**DISCHARGE IN ANY DIRECTION.**

**BUILT IN 5 H. P., 7½ H. P., 10 H. P., and 25 H. P. SIZES,** each designed to operate continuously when receiving the full output of a 40 degree Centigrade Electric Motor of corresponding size.

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Many railroads are meeting this new condition both successfully and economically by building permanent grade crossings of Headley No. 1.

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Ideal bonding material for Spring, Summer and Fall construction with these advantages—

Requires no heating.

No curing or drying—placed as mixed.

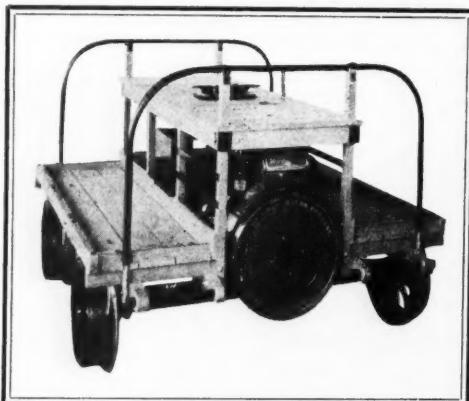
Coats either wet or dry aggregate.

Mixed by hand or machine, at point of installation or at central plant.

Always tough—will not push in summer nor crack in winter.

**Headley Good Roads Company**  
Franklin Trust Building  
Philadelphia Pa.

## UNIVERSAL POWER CAR FOR MAINTENANCE-OF-WAY FORCES



### A REAL POWER PLANT

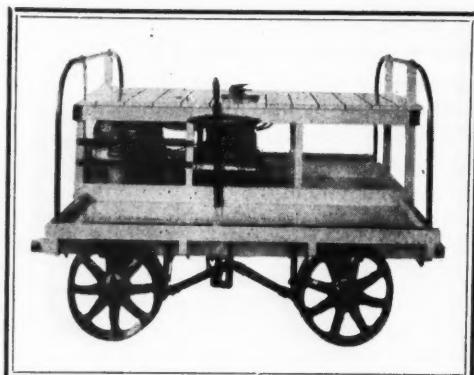
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Developing 110 Volts, DC or AC Current.  
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and Paint-Spraying  
and other electric tools now on the market.

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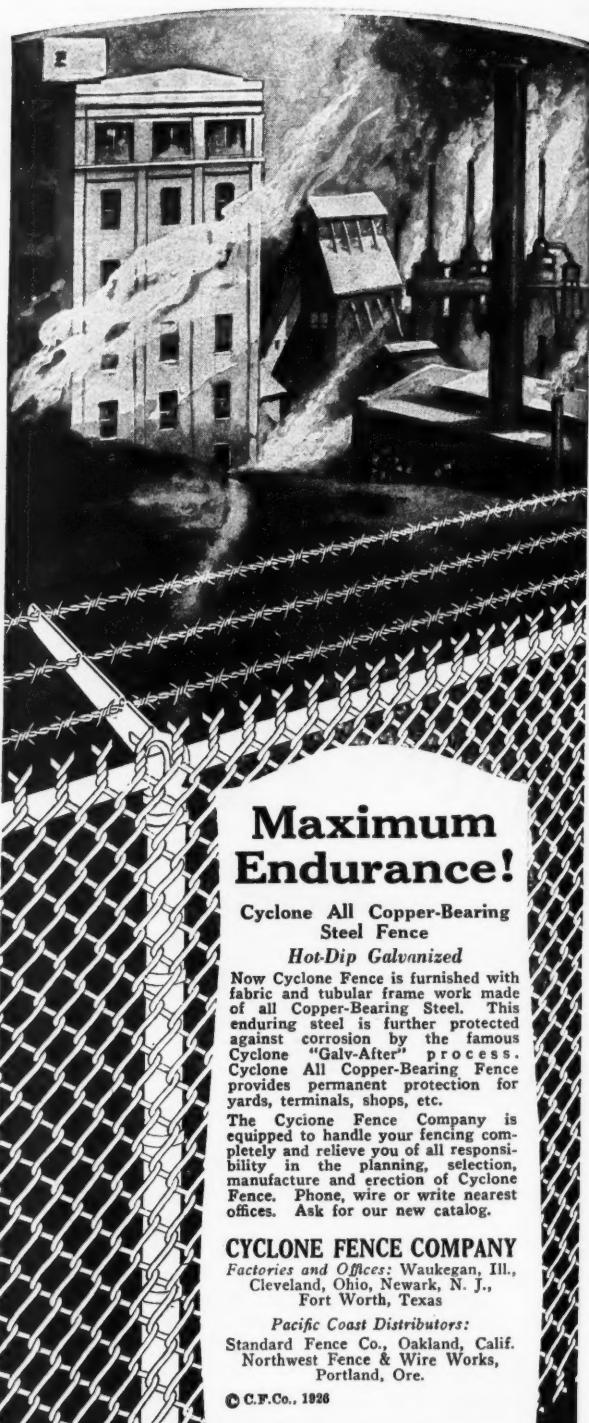
Is easily handled from track by 6 men.  
Two men can easily remove at road crossings.



Takes the men and power to the job.  
Works while the men work.  
More work with the same force.

*Circular and information at Booth 203  
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send for complete description.*

**THE EUCLID ELECTRIC & MFG. CO.  
EUCLID OHIO**



## Maximum Endurance!

### Cyclone All Copper-Bearing Steel Fence Hot-Dip Galvanized

Now Cyclone Fence is furnished with fabric and tubular frame work made of all Copper-Bearing Steel. This enduring steel is further protected against corrosion by the famous Cyclone "Galv-After" process. Cyclone All Copper-Bearing Fence provides permanent protection for yards, terminals, shops, etc.

The Cyclone Fence Company is equipped to handle your fencing completely and relieve you of all responsibility in the planning, selection, manufacture and erection of Cyclone Fence. Phone, wire or write nearest offices. Ask for our new catalog.

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*Factories and Offices: Waukegan, Ill.,  
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Northwest Fence & Wire Works,  
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# Cyclone Fence

The Mark  
of Quality



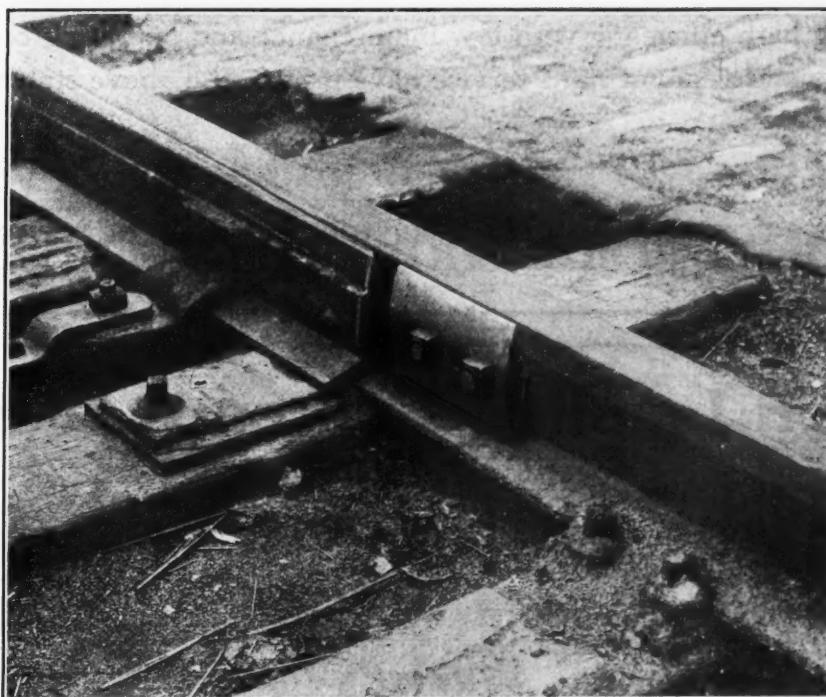
Fence and  
Service

CYCLONE COPPER-BEARING STEEL ENDURES

# The Reversible "Mack" Switch Point Protector THIS IS IT!

A NEW and distinct maintenance economy is made not only possible, but entirely practical, in the Reversible "Mack" Switch Point Protector. Mechanically, it is simplicity itself. As shown in the illustration, the "Mack" as now made, gives double the service by means of the simple operation of inverting it after one edge shows sufficient wear to make a new protector advisable.

In other words, the lower edge becomes the top edge and the service life of the protector extended to double the wear without additional cost. Positively the most economical way to protect the switch point—and add years to its life.



## An Economic and Safety Device

LET the Mack Switch Point Protector absorb the wear and increase the life of your switch points.

Mack Switch Point Protectors are simple, inexpensive, and positive in action. For switch points to last ten times longer with this protection is not uncommon in actual service tests.

Installation can be made easily at small cost—replacements are made in a few minutes by one man—their efficiency is not impaired by weather conditions.

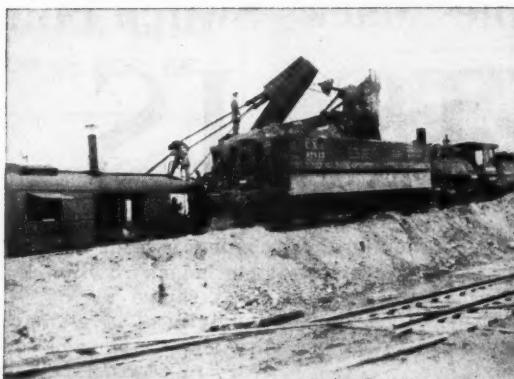
"Mack" Switch Protectors are made of manganese steel, for any size rail.

*Send us a description of rail used, and we will furnish you a few protectors for test*

**J. R. FLEMING & SONS, INC.  
SCRANTON, PA.**

Patented in U. S. and Foreign Countries

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## AUTOMATIC AIR DUMP CARS

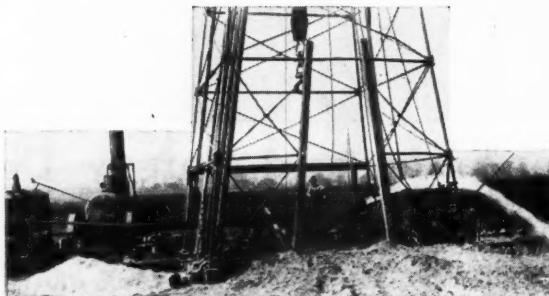
Combining high efficiency with low maintenance and operating costs. Many tests and years of hard service have proven the above statement to be a fact.

*You will be interested in our Catalogue "D," which will be sent upon request*

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## Ten Leading Railroads Use 60 Layne Wells and Pumps



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They realize the need of de-  
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Under the Layne Method a  
given quantity of water is  
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Must produce water at lowest  
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Layne & Bowler Manufacturing Company  
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The Indiana Harbor Works of the Inland Steel Company—one of three plants of this company serving steel users of the Middle West, South, and West.

## At the Service of Steel Users In This Great Consuming Market

**Products of  
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*Mills at  
Indiana Harbor and Milwaukee*

### Basic Open Hearth Steel

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- Bar Angles
- Structural Shapes
- Sheared Plates
- Universal Mill Plates
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- Railroad Track Bolts
- Railroad Track Spikes
- Railroad Tie Plates
- Splice Bars
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*A complete line of Bars, Sections and Shapes is rolled from Rail Steel at the Chicago Heights Works*

**A**LMOST at the front door of the steel consumers of the great Chicago district are the efficient producing plants of the Inland Steel Company.

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The Inland trademark indicates dependability.

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Look Better  
Last Longer



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Expensive

## The Choice of 17 Railroads

THE fact that seventeen railroads are now using "Improved" O. G. Fir Gutters would indicate to the most conservative that these gutters are superior to metal gutters for railroad buildings.

"Improved" O. G. Fir Gutters withstand smoke, gases, acid fumes and the elements without the least corrosion or disintegration. That's why they outlast metal by many years. They are neat and attractive and improve the appearance of the building. "Improved" O. G. Fir Gutters are an economy that should not be overlooked.

They are made of old growth yellow fir in stock sizes 3x5 in. 4x6 in. and 5x7 in. and in lengths 10 to 40 feet.

*Write today for a box of sample gutters and a booklet describing "Improved" O. G. Fir Gutters in detail.*

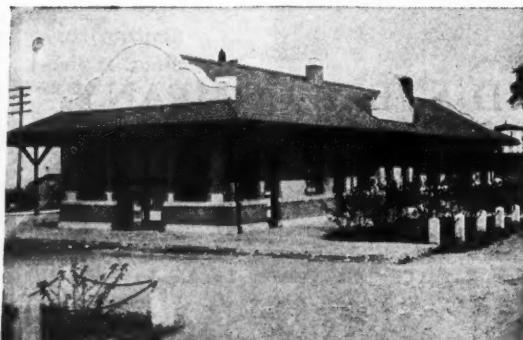
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This trade-mark on every piece

Ohio



"Improved" O. G. Fir Gutters make a neat and permanent finish on this station.

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IS KNOWN the world over—for since the beginning of the railroad industry this company has been inseparably associated in the design and application of better track work.



The severest pounding of modern power only serves to demonstrate the greater endurance of Wharton equipment.

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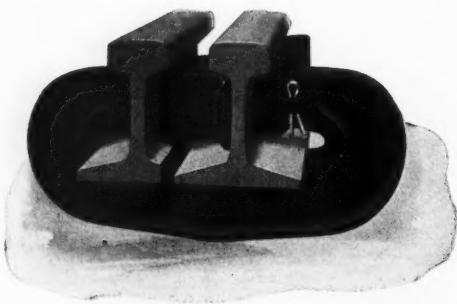
*For Economy's Sake—Try It!*

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# Cut Devil Chisel

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### ADJUSTABLE GUARD RAIL CLAMP

A clamp for heavy service with universal drop forged yoke made of special heat treated steel.

This clamp is GUARANTEED. A clamp that is not dependable is expensive at any price.

Made for rails from 80 to 130 lbs. per yd.

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A heavy malleable brace for general use on switches, slip switches and guard rails.

Should be in use on all interlocked switches to insure an easy and close adjustment for taking up wear between rail, brace and plate.

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The American Railway Engineering Association voted approval of pumping water by means of hydraulic rams where they can be used, at the Convention which was held in Chicago March 10th to 12th.

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*Write for catalogue complete on Rife Hydraulic Rams.*

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## Visit the Coliseum

While in Chicago attending the convention of the American Railway Engineering Association don't forget to visit the

### EXHIBIT

of the

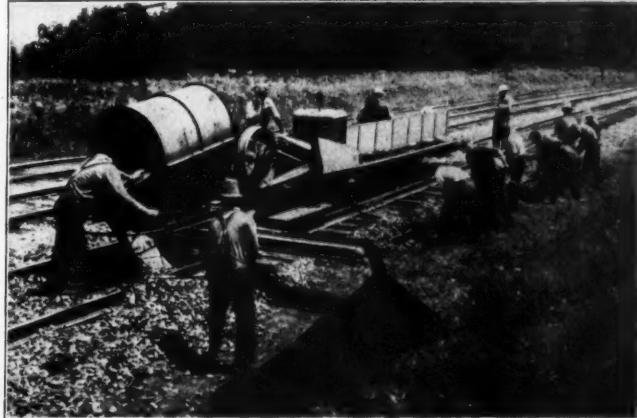
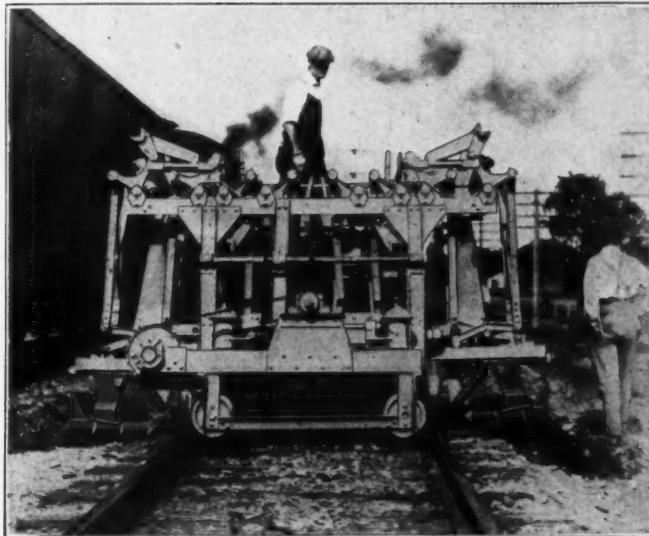
National Railway Appliances Association  
at the  
Coliseum

You will be sure to see many things of great interest, and your visit will be appreciated by all exhibitors.

## 3 GREAT LABOR SAVING BALLASTING MACHINES

### THE POWER SKELETONIZING MACHINE

Will skeletonize track at the rate of 1 or more cribs per minute.



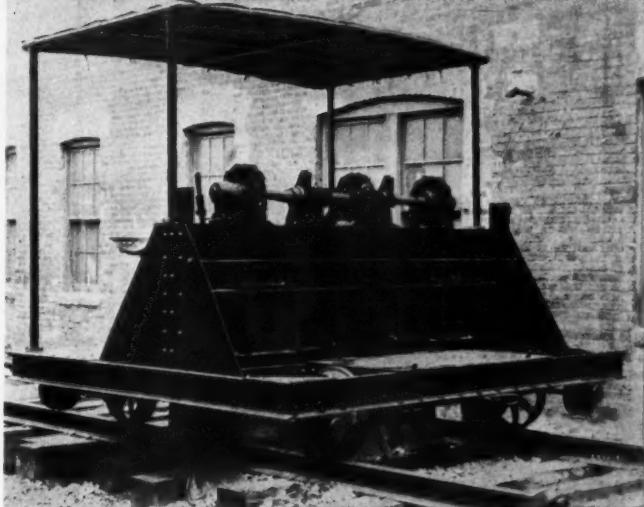
### THE POWER BALLAST SCREEN

Used on many roads—where the cost of screening the ballast has been reduced to a minimum through its use.

### THE JACKSON POWER TRACK BALLASTER

Used for heavy lifts of 4 inches or more. Will proceed at the rate of from 250 to 300 feet of single track per hour.

*Write for information*



**THE MAINTENANCE EQUIPMENT CO.**  
Railway Exchange, Chicago, Ill.

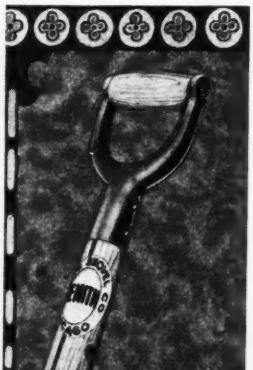


### -THE SHOVEL WITH A BACKBONE-

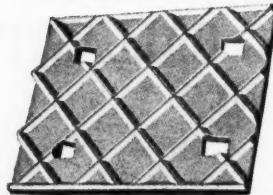
The backbone that doubles the life of a shovel—a cost feature worth considering. We have issued a booklet "Shovel Troubles Overcome" wherein we explain the "backbone" and its purpose.

There are four weaknesses in shovels, each of which has been corrected in the Zenith.

Write for a copy of the booklet—it is interesting.



## Sellers Anchor Bottom



### Wrought Iron Tie Plates

#### Efficient

{ Hold track to gauge  
Seat square to the rail  
Do not injure the tie  
Stop season checks in tie  
Bottom ribbing is a truss equal  
to one sixteenth inch additional solid section.

#### Durable

{ Rolled end over end  
Never break  
Made of Wrough Iron—  
corrosion retarded

Made in all sizes—with level or tapered rail seat, and with or without crown or cambre

#### SELLERS MANUFACTURING COMPANY

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## WOODINGS Forge and Tool Co.

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MANUFACTURER OF

## TRACK TOOLS

ADZES  
TRACK CHISELS  
PICKS  
SLEDGES

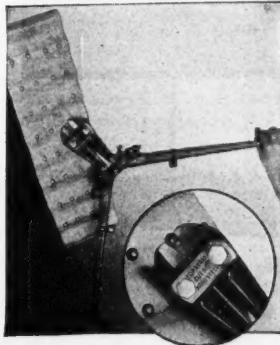
CLAW BARS  
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*All Standard High Grade Tools*

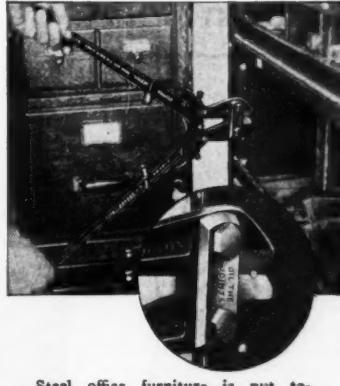
#### SPECIAL EQUIPMENT FOR REPAIRING TOOLS

GENERAL SALES OFFICE  
VERONA, PA.

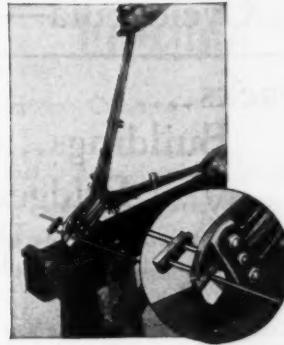
*These Are*  
**Bolt Clipper Times**

**VOL. I****EVERETT MASS., U.S.A.****NO. 1**

Using an angular clipper to cut off rivets in conveyor belt.



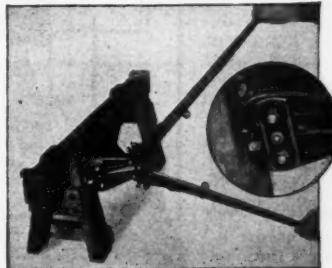
Steel office furniture is put together with bolts—note how easily the angular cutter reduces the bolt to proper length.



Cutting rod—note adjustable gauge on head of Clipper to enable operator to cut even lengths.

### Cutting the Pay Roll

That is one of the many operations space does not permit us to show on this page; nevertheless, it is one of the fundamentals of Porter Clipper service—the saving of man time and man power. We cannot picture or list all of the uses you may have for Porter tools but in this mechanical age we know that you do have uses for these tools and that failure to use them means loss of time, loss of temper and waste of effort. If you are an employer of workmen then the value of Porter Clippers to you is multiplied by the number



This shows a nut splitter in action—splits nut so it falls from bolt. A time saver when nuts are rusted on and won't turn.

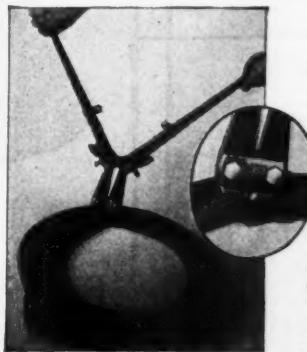
of men you employ and losses arising from failure to use these tools are similarly multiplied.

This advertisement is not intended to sell you anything but to interest you sufficiently so that you will take the trouble to find out what a bolt clipper is and why, to find out about the kind of work this tool in its various styles will do. Once you find out you will keep on finding out—finding new uses and new ways to save time and to save money.

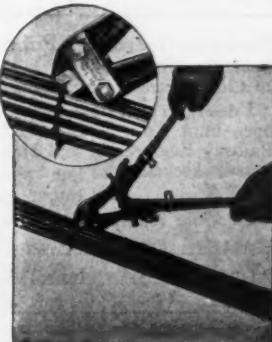
Write today to your jobber or supply house for the Porter Manual—or write direct to H. K. Porter, Inc., Everett, Mass.



Bags of castings are fastened with heavy wire—this man clips the wire with one of the small Porter tools.



No time is lost cutting the wire around this bundle of rods. Later a Porter Clipper will reduce the rods to desired lengths.



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of modern engineering  
and maintenance practice

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Engineering and Maintenance  
Cyclopedia—1926 Edition

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Buildings....

Bridges....

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Signaling....

**I**N these five big sections the new "Railway Engineering and Maintenance Cyclopedias" covers every phase of modern maintenance engineering practice. This book fills a definite need in the railway industry by supplying a wealth of new information, exhaustive in scope, on new developments, improvements, new devices—in fact on every feature of importance to the railway engineering and maintenance field today. It is veritably a maintenance library in one authoritative, comprehensive, and eminently practical volume. The following list of topics, which are covered in detail under the track section, will indicate how thoroughly every subject is discussed: Roadway standards, Grading and Grading Equipment, Drainage and Ditching Equipment, Snow and Ice Removal, Weed Destroyers, Ballast, Ballast Application and Cleaning, Ties, Rails, Rail Renewal and Maintenance, Rail Joints and Fastenings, Rail Joint Accessories, Tie Plates, Anti-Creepers, Switches, Frogs and Crossings, Guard Rails, Switch Stands, Derails, Bumpers and Car Stops, Fencing, Highway Crossings, Signs, Motor Hand and Push Cars, Track Jacks, Shovels, Miscellaneous Tools and Equipment.

You men who must know in order to act efficiently, you men who cannot afford to make mistakes, need the authoritative, invaluable information which only the Cyclopedias can give. The 1926 edition edited by Elmer T. Howson, and W. F. Rensch with the co-operation of the American Railway Engineering Association, will be ready for distribution March 15.

## Special Pre-publication Offer

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Here is the Mule-Hide Plant—covering approximately 5 acres of ground,—with the aid of the most modern machinery devised for the manufacture of asphalt roofing,—an entertaining hour may be most profitably spent seeing and learning how Mule-Hide is manufactured.

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This condensation has permitted the author to do what few have done previously—make the least demand upon the readers' time in giving him the meat of modern maintenance practice. Your best bet is "Roadway and Track" if you want facts you can apply to your own work. You may keep this book for 5 days without cost. Order today.

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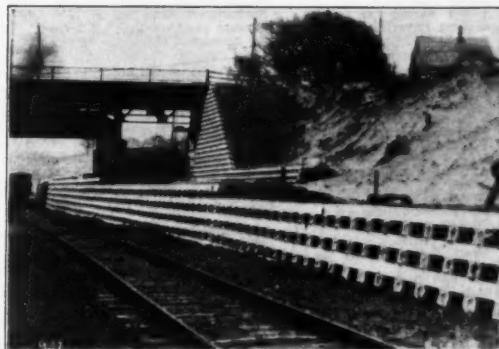
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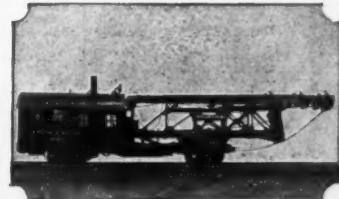
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Ohio Valley Rock Asphalt Co.	Koppen Industrial Car & Equipment Co.	Corrugated Iron.	Floor Coverings.	Junction Boxes.
Co.	Carey Co.	Arco Culvert & Flume Mfrs. Assn.	Barber Asphalt Co.	Massey Concrete Products Corp.
Lahon Co.	Euclid Electric Mfg. Co.	Derails.	Lehon Co.	Knickles, Emergency.
Ballast Cars.	Kalamazoo Railway Supply Co.	American Chain Co., Inc.	Forgings.	Ladders, C. Co.
Clark Car Co.	Mudge & Co.	Q. & C. Co.	Bethlehem Steel Co.	Industrial Works.
Rodger Ballast Car Co.	Koppen Industrial Car & Equipment Co.	Wharton, Jr., & Co., Inc., Wm.	Frogs.	Liners, Track.
Band Saws.	Carey Co.	Derrick Cars.	Bethlehem Steel Co.	Chicago Steel Foundry Co.
American Saw Mill Machinery Co.	Euclid Electric Mfg. Co.	Maintenance Equipment Co.	Frogs.	Hackmann Railway Supply Co.
Ballast Screens	Kalamazoo Railway Supply Co.	Curtain.	Bethlehem Steel Co.	Rail Joint Co.
Maintenance Equipment Co.	Mudge & Co.	Massey Concrete Products Corp.	Frogs.	National Lock Washer Co.
Ballast Spreaders.	Koppen Industrial Car & Equipment Co.	Derrick.	Positive Lock Washer Co.	Positive Lock Washer Co.
Jordan Co., O. F.	Carey Co.	American Chain Co., Inc.	Reliance Manufacturing Co.	Reliance Manufacturing Co.
Rodger Ballast Car Co.	Euclid Electric Mfg. Co.	Q. & C. Co.	Locomotives, Oil Engines,	Locomotives, Oil Engines.
Western Wheeled Scraper Co.	Fairbanks, Morse & Co.	Wharton, Jr., & Co., Inc., Wm.	Electric Driven.	Industrial Driven.
Bars.	Falmont Railway Motors, Inc.	Derricks.	Ingersoll-Rand Co.	Locomotives.
Bethlehem Steel Co.	Kalamazoo Railway Supply Co.	McMyler Interstate Co.	Bethlehem Steel Co.	Locomotives.
Inland Steel Co.	Mudge & Co.	Diesel Engines.	Frogs.	Industrial Works.
Interstate Iron & Steel Co.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Frogs.	Lubricants.
Bearings, Axle.	Carey Co.	Diesel Electric Power Plants	Positive Lock Washer Co.	Dixon Crucible Co., Jas.
Buds Co.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Reliance Manufacturing Co.	Machine, Grading.
Fairbanks, Morse & Co.	Koppen Industrial Car & Equipment Co.	Diesel Machines.	W. S. Massey Concrete Products Corp.	See Grading Machinery.
Fairmont Railway Motors, Inc.	Carey Co.	Fairmont Railway Motors, Inc.	W. S. Massey Concrete Products Corp.	Manganese Trask Work.
Kalamazoo Railway Supply Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Dixon Crucible Co., Jas.	Buds Co.
Mudge & Co.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Grades, Measuring.	Frogs.
Northwestern Motor Co.	Carey Co.	Diesel Machines.	Luhrs Rule Co.	Globe Halls.
Woolsey Machine Co.	Euclid Electric Mfg. Co.	Fairmont Railway Motors, Inc.	Gardner Governor Co.	Bethlehem Steel Co.
Bearings, Roller.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	Gagin Governor Co.
Hyatt Roller Bearing Co.	Carey Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	Graders, Elevating.
Benders, Rail.	Euclid Electric Mfg. Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
See Rail Benders.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Blasting Powders	Carey Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Blasting Supplies.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
DuPont de Nemours & Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Blocks, Hollow Building.	Carey Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Dickey Clay Mfg. Co., W. S.	Euclid Electric Mfg. Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Blocks, Flashing.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Dickey Clay Mfg. Co., W. S.	Carey Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Blueprint Machinery	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
Pease Co., C. F.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Bonding Outfits, Rail.	Carey Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Ingersoll-Rand Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Bolts.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Bethlehem Steel Co.	Carey Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Bolt Clipper	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Graphite.	Dixon Crucible Co., Jas.
Porter Inc., H. K.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Briar Fire.	Carey Co.	Fairbanks, Morse & Co.	Gardner Governor Co.	Grinding, Grinding.
Dickey Clay Mfg. Co., W. S.	Euclid Electric Mfg. Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Buckets.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
McMyler-Interstate Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Own Bucket Co.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Buckets, Clay Shell.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Industrial Works.	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
McMyler-Interstate Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Own Bucket Co.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Building Beams, Concrete.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
R. C. Products Co., Inc.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Building Papers.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Barber Asphalt Co.	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
Lehon Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Burning Posts.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Buds Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Louisville Frog & Switch Co.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Mechanical Manufacturing Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Calcium Carbide	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
Oxwald Railroad Service Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Car Stop, Friction Maintenance Equipment Co.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Cars, Ballast.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
See Ballast Cars.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Cars, Dump.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
See Dump Cars.	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
Car Dumper	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
McMyler-Interstate Co.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Cars, Hand.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Buds Co.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Fairbanks, Morse & Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Fairmont Ry. Motors, Inc.	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
Kalamazoo Railway Supply Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Mudge & Co.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Northwestern Motor Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Oxwald Railroad Service Co.	Euclid Electric Mfg. Co.	Fairbanks, Morse & Co.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Car Stop, Friction Maintenance Equipment Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Cars, Ballast.	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
See Ballast Cars.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Cars, Dump.	Koppen Industrial Car & Equipment Co.	Fairbanks, Morse & Co.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
See Dump Cars.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Car Dumper	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
McMyler-Interstate Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Cars, Hand.	Carey Co.	Fairbanks, Morse & Co.	Grinders, Portable.	Grinding, Grinding.
Buds Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Fairbanks, Morse & Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Fairmont Ry. Motors, Inc.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Kalamazoo Railway Supply Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Crossing Gates.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Buds Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Mudge & Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Northwestern Motor Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Oxwald Railroad Service Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Car Stop, Friction Maintenance Equipment Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Cars, Ballast.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
See Ballast Cars.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Cars, Dump.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
See Dump Cars.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Car Dumper	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
McMyler-Interstate Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Cars, Hand.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Buds Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Fairbanks, Morse & Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Fairmont Ry. Motors, Inc.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Kalamazoo Railway Supply Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Crossing Gates.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Buds Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Mudge & Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Northwestern Motor Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Oxwald Railroad Service Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Car Stop, Friction Maintenance Equipment Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Cars, Ballast.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
See Ballast Cars.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Cars, Dump.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
See Dump Cars.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Car Dumper	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
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Buds Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Fairbanks, Morse & Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Fairmont Ry. Motors, Inc.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Kalamazoo Railway Supply Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
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Buds Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Mudge & Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Northwestern Motor Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Oxwald Railroad Service Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Car Stop, Friction Maintenance Equipment Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Cars, Ballast.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
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Cars, Dump.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
See Dump Cars.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
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McMyler-Interstate Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Cars, Hand.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Buds Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Fairbanks, Morse & Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Fairmont Ry. Motors, Inc.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Kalamazoo Railway Supply Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Crossing Gates.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Buds Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Mudge & Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Northwestern Motor Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Oxwald Railroad Service Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Car Stop, Friction Maintenance Equipment Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Cars, Ballast.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
See Ballast Cars.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Cars, Dump.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
See Dump Cars.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Car Dumper	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
McMyler-Interstate Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Cars, Hand.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Buds Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Fairbanks, Morse & Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Fairmont Ry. Motors, Inc.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Kalamazoo Railway Supply Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Crossing Gates.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Buds Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Mudge & Co.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
Northwestern Motor Co.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Oxwald Railroad Service Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
Car Stop, Friction Maintenance Equipment Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Cars, Ballast.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
See Ballast Cars.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
Cars, Dump.	Carey Co.	Drill, Rock.	Grading Machinery.	W. S. Massey Concrete Products Corp.
See Dump Cars.	Euclid Electric Mfg. Co.	Drill, Rock.	Western Wheeled Scraper Co.	W. S. Massey Concrete Products Corp.
Car Dumper	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graphite.	Dixon Crucible Co., Jas.
McMyler-Interstate Co.	Carey Co.	Drill, Rock.	Grinders, Portable.	Grinding, Grinding.
Cars, Hand.	Euclid Electric Mfg. Co.	Drill, Rock.	Gardner Governor Co.	Grinding, Grinding.
Buds Co.	Koppen Industrial Car & Equipment Co.	Drill, Rock.	Graders, Elevating.	W. S. Massey Concrete Products Corp.
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*Get Going*



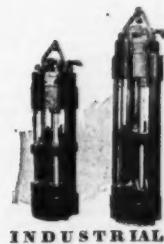
INDUSTRIAL combination crane-pile driver driving piles thirty feet from track center. The leader truss is easily removed and a regular crane boom substituted for locomotive crane service.



INDUSTRIAL railroad type pile driver with leaders folded into clearance position.



INDUSTRIAL all-steel railroad type pile driver redriving piles on bridge approach.



INDUSTRIAL long and short stroke double acting steam pile hammers.

## ON THAT RECONSTRUCTION WORK *Spring is not far off—*

**A**ND with the Spring comes the thaw, and all the damage and destruction caused by swollen rivers. Can your bridges and trestles stand the strains of another heavy Spring without additional strengthening? Hadn't you better think this matter over seriously right now?

When there is pile driving to be done, why not have an INDUSTRIAL do the job? INDUSTRIAL pile drivers have been especially developed for American railroads, and they are built to meet the conditions encountered in the building and maintenance of bridges and trestles. It makes no difference whether the piles are wood, steel or concrete, an INDUSTRIAL driver with an INDUSTRIAL steam hammer will make light work of the task. A card will bring specific data on any of our pile driving equipment. Write today!



Crawling tractor, locomotive,  
wrecking and freight cranes, rail  
saws, pile drivers, steam ham-  
mers, clamshell buckets.

# INDUSTRIAL WORKS

BAY CITY  
MICHIGAN

## BUYERS' GUIDE

Piling.	Lundie Engineering Corp.	Sharpeners, Rock Drill Steel	Bethlehem Steel Co.	Track Jacks.
International Creosoting & Constructing Co.	P. & M. Co.	Ingersoll-Rand Co.	Budd Co.	See Jacks, Track.
Massey Concrete Products Corp.	Vermont Tool Works	Structural Iron.	Mordern Frog & Crossing Works	Track Liners.
Pipe Creepers.	Anti-Creepers.	Armen, Culvert & Flume Mfrs. Assn.	Ramapo-Ajax Corp.	See Liners, Track.
Pipe Carriers.	Massey Concrete Products Corp.	Shinglers, Composition.	Bethlehem Steel Co.	Track, Portable.
Pipe, Cast Iron.	American Casting Co.	Barber Asphalt Co.	Western Wheeled Scraper Co.	
Cast Iron Pipe Publicity Bureau.	U. S. Cast Iron Pipe & Foundry Co.	Lehman Co.		
Rail Binders.	Pipes, Concrete.	Shovels.	Tamper, Tie.	
American Chain Co., Inc.	Massey Concrete Products Corp.	Zenith Shovel Co.	See Tie Tamper.	
Rail Bonds.	Verona Tool Works	Verona Tool Works	Tank Fixtures.	
Rail Braces.	Rail Braces.	Ramapo-Ajax Corp.	Fairbanks, Morse & Co.	
Bethlehem Steel Co.	Bethlehem Steel Co.	Wm. Wharton Jr. & Co., Inc.	Tank Valves.	
Morden Frog & Crossing Works.	Morden Frog & Crossing Corp.	Wm.	American Valve & Meter Co.	
Rail Layers.	Skid Shoes.	Smoke Stack.	Tanks, Water Storage.	
Maintenance Equipment Co.	Q. & C. Co.	Massey Concrete Products Corp.	Fairbanks, Morse & Co.	
Rail Joints.	Slabs, Concrete.	Snow Melters, Electric.	Tapes.	
See Joint, Rail.	Massey Concrete Products Corp.	Soil Plow.	Lufkin Rule Co.	
Rail Saws, Portable.	Spikes.	Jordan Co., O. F.	Tee Rails.	
Industrial Works.	Bethlehem Steel Co.	Special Track Work.	See Rails, Tee.	
Railroad Supply Co.	Inland Steel Co.	Morden Frog & Crossing Works.	Telephone Poles.	
Q. & C. Co.	Interstate Iron & Steel Co.	Spikes.	Ties.	
Rail Springs.	Lundie Engineering Corp.	Bethlehem Steel Co.	International Creosoting & Construction Co.	
Verona Tool Works.	Ingersoll-Rand Co.	Inland Steel Co.	Tie Plate Clamps.	
Rammers, Sand.	Removers, Paint.	Interstate Iron & Steel Co.	Q. & C. Co.	
Verona Tool Works.	Mudge & Co.	Scare Cars.	Tie Plates.	
Replacers, Car.	American Chain Co., Inc.	Spreader, Ballast.	Bethlehem Steel Co.	
Railway Walls.	Rods Co.	See Ballast Spreaders.	Inland Steel Co.	
R. C. Products Co., Inc.	Massey Concrete Products Corp.	Standpipes (Penstock).	Interstate Iron & Steel Co.	
Rivets.	Bethlehem Steel Co.	American Valve & Meter Co.	Lundie Engineering Corp.	
Bethlehem Steel Co.	Inland Steel Co.	Fairbanks, Morse & Co.	Tie Rods.	
Interstate Iron & Steel Co.	Interstate Iron & Steel Co.	Stands, Switch & Trestle.	Bethlehem Steel Co.	
Rods, Wires.	Interstate Iron & Steel Co.	American Valve & Motor Co.	Tie Spacers.	
Roller Bearings.	Ramapo-Ajax Corp.	Bethlehem Steel Co.	American Chain Co., Inc.	
Hartt Roller Bearing Co.	Rod.	Q. & C. Co.	Co.	
Roof Slabs.	Hartt Roller Bearing Co.	Maintenance Equipment	Maintenance.	
Massey Concrete Products Corp.	Hyatt Roller Bearing Co.	Electric Tamper & Equipment Co.	International Creosoting & Construction Co.	
Roofing.	Hyatt Roller Bearing Co.	Ingersoll-Rand Co.	Tools, Pneumatic.	
Bethlehem Steel Co.	Hyatt Roller Bearing Co.	Maintenance Equipment Co.	Ingersoll-Rand Co.	
Interstate Iron & Steel Co.	Hyatt Roller Bearing Co.	Tools, Track.	Tools, Track.	
Rules.	Hyatt Roller Bearing Co.	Hackmann Railway Supply Co.	Hackmann Railway Supply Co.	
Lufkin Rule Co.	Hyatt Roller Bearing Co.	Headley Good Roads Co.	Headley Good Roads Co.	
Saw Mills.	Hyatt Roller Bearing Co.	Hyatt Roller Bearing Co.	Industrial Works.	
American Saw Mill Machinery Co.	Hyatt Roller Bearing Co.	Industrial Works.	Kalamazoo Railway Supply Co.	
Saws, High Speed Friction.	Hyatt Roller Bearing Co.	Ingersoll-Rand Co.	Kentucky Rock Asphalt Co.	
American Saw Mill Machinery Co.	Hyatt Roller Bearing Co.	Inland Steel Co.	Koppel Industrial Car & Equip. Co.	
Saw Mill.	Hyatt Roller Bearing Co.	International Creosoting & Construction Co.	Layne & Bowler Mfg. Co.	
American Saw Mill Machinery Co.	Hyatt Roller Bearing Co.	Interstate Iron & Steel Co.	Layne & Bowler Mfg. Co.	
Scalers, Track.	Hyatt Roller Bearing Co.	Jordan Co., O. F.	Lehman Co.	
Fairbanks, Morse & Co.	Hyatt Roller Bearing Co.	Kalamazoo Railway Supply Co.	Lindberg Machine Co.	
Push & Hand Car Bearings.	Hyatt Roller Bearing Co.	Hyatt Roller Bearing Co.	Woolery Machine Co.	
Hyatt Roller Bearing Co.	Hyatt Roller Bearing Co.	Industrial Works.	Woolery Machine Co.	
Push & Hand Car.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Buds Co.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Fairbanks, Morse & Co.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Fairmont Railway Motors, Inc.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Mudge & Co.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Woolery Machine Co.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Ball.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Inland Steel Co.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Ball Anchors.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
American Fork & Hoe Co.	Hyatt Roller Bearing Co.	Kalmar Industries Co.	Woolery Machine Co.	
Screw Spike Drivers.	Ingersoll-Rand Co.	Kalmar Industries Co.	Woolery Machine Co.	
Section Cars.	See Cars, Section.	Kalmar Industries Co.	Woolery Machine Co.	
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Carey Co., Philip.		Kalamazoo Railway Supply Co.	Ohio Valley Rock Asphalt Co.	
Cast Iron Pipe Publicity Bureau.		Headley Good Roads Co.	Owen Bucket Co.	
Celite Products Co.		Hyatt Roller Bearing Co.	Oxweld Acetylenes Co.	
Chicago Steel Foundry Co., Inc.		I	Oxweld Railroad Service Co.	
Chipman Chemical Engineering Co.		Industrial Works.	P. & M. Co.	
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Dickey Clay Mfg. Co., W. S.		Inland Steel Co.	Porter, Inc., H. K.	
Differential Steel Car Co.		International Creosoting & Construction Co.	Prest-O-Lite Co.	
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E		K	R. C. Products Co., Inc.	
Electric Tamper & Equipment Co.		Kalamazoo Railway Supply Co.	Rail Join Co.	
Euclid Electric & Mfg. Co.		Kentucky Rock Asphalt Co.	Ramapo-Ajax Corp.	
Fairbanks, Morse & Co.		Koppel Industrial Car & Equip. Co.	Reliance Manufacturing Co.	
Fairmont Railway Motors, Inc.		Layne & Bowler Mfg. Co.	Rife Engine Co.	
Fleming & Sons Co., Inc., J. R.		Lide Air Products Co.	Roger Ballast Car Co.	
Frog Switch & Manufacturing Co.		Long & Sons, E. M.	S	
G		Louisville Frog & Switch Co.	Sellers Manufacturing Co.	
Gardner Governor Co.		Lufkin Rule Co.	Simmons-Boardman Publ. Co.	
H		Lundie Engineering Corp.	Sullivan Machinery Co.	
Aldrich Pump Co.	58	M	U. S. Cast Iron Pipe & Foundry Co.	
American Casting Co.	6	McMyler-Interstate Co.	Union Carbide Sales Co.	
American Chain Co., Inc.	58	Magor Car Corp.	Verona Tool Works.	
American Fork & Hoe Co.	54	Maintenance Equipment Co.	Warren Forge & Tool Co.	
American Saw Mill Machinery Co.	60	Massey Concrete Products Corp.	Western Wheeled Scraper Co.	
American Valve & Meter Co.	24-25	Mechanical Manufacturing Co.	Woodring Forge & Tool Co.	
American Water Softener Co.	58	Morden Frog & Crossing Works.	Woodworking Machinery.	
American Well Works.	35	Mudge & Co.	Wrecking Cranes.	
Armo Culvert & Flume Mfrs. Assn.	53	Murdock Mfg. & Supply Co.	Industrial Cranes.	
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## SULLIVAN LABOR-SAVING EQUIPMENT

### for the Railroad Maintenance Engineer

**The Sullivan  
Air Lift  
Pumping System**

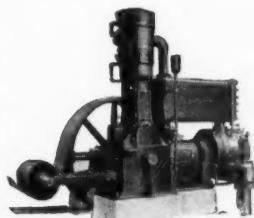
For railway water supply, the SULLIVAN AIR LIFT PUMPING method is dependable and has many advantages for well pumping, whether for main line locomotive supply or for shop or terminal service for the following reasons in which labor saving is apparent: Simplicity and durability, no moving parts under water (no repairs or renewals); any number of pumps may be controlled from one central power plant; economy of power is secured on high lifts by compound or stage pumping; water may be carried horizontally as well as vertically; pumps are not affected by mud or sand (no labor for cleaning); impurities are removed readily and water rendered more susceptible to softening treatment; adaptable to remote control and stop and start service (minimum inspection and attendance); long sustained efficiency; adaptable without mechanical changes to varying water levels.



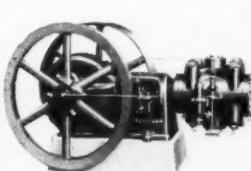
Sullivan Air Lift on the Southern Pacific, El Paso, Texas  
(Railroad Bulletin No. 19129)

**Sullivan  
Air  
Compressors**

SULLIVAN AIR COMPRESSORS are available in numerous types and sizes for steam, belt or direct drive from motor, or oil or gas engine, for all classes of service. The distinctive "angle-compound" type has many special features and is noted for efficiency and compactness.



"WJ-3" Angle-Compound Compressor  
(Bulletin 1983-A)



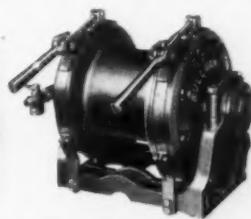
"WG-6" Belted Single Stage Compressor  
(Bulletin 1983-B)

**Sullivan  
Portable  
Compressors**

For construction and outdoor maintenance requiring rock drilling, concrete removal, clay digging, spray painting, riveting, drilling wood or metal, a SULLIVAN PORTABLE COMPRESSOR will help cut labor costs and speed up the job. Sizes are 110-170-220-320 cu. ft. Gasoline engine driven compressors are direct-connected to



"WK-314" 220-ft. Portable Compressor  
Bulletin 1977-N



Sullivan Portable Turbinair Hoist  
(Bulletin 1976-F)

Buda tractor type units, and mounted on steel or rubber tired wheels, highway trailer trucks, or skids.

**Sullivan  
Turbinair  
Hoists**

SULLIVAN PORTABLE HOISTS are built in air, steam or electric, single or two drum models, 6½ hp. They have 2000 lb. capacity on vertical lift, or will pull a 50-ton car on level track. They can be used for spotting cars, handling rails or ties on derricks, etc.

**Sullivan  
Air Power  
Tools**

"ROTATORS," "BUSTERS" and "SPADERS" are rapid, powerful, convenient hammer drills for rock, concrete, or clay removal. An outfit of these tools plus a portable compressor, will save much time and labor on any section.



"Rotator"  
(Bulletin 1981-F)



Concrete Breaker  
(Bulletin 1981-I)



Clay Spader  
(Bulletin 1981-J)

COMPRESSORS · AIR LIFT · COAL CUTTERS · DIAMOND CORE DRILLS · ROCK DRILLS  
PORTABLE HOISTS · DRILL SHARPENERS AND FURNACES · BUSTERS · SPADERS

**SULLIVAN**  
MACHINERY COMPANY  
TRADE MARK  
NEW YORK LONDON PARIS TOKYO SYDNEY  
411 PEOPLES GAS BUILDING, CHICAGO



## Two jobs to do—A Two-Piece Anchor to do them

A rail anchor has two jobs to do. It must keep the rail from creeping and it must cling to the rail perpetually without slipping or chattering loose.

These two functions are quite distinct and different. They cannot be performed efficiently by a single mechanism.

The Ericson is a two-piece anchor. It consists of a malleable iron shoe to keep the rail from creeping and a steel yoke to hold the shoe in place.

More than two million Ericson anchors have proved their unfailing ability to do both jobs.



**VERONA TOOL WORKS**

Pittsburgh New York Chicago Boston St. Louis San Francisco  
New Orleans Washington St. Paul Denver Baltimore Louisville

